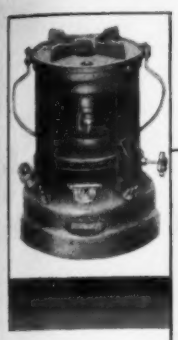
No. 11

Telephone Engineer

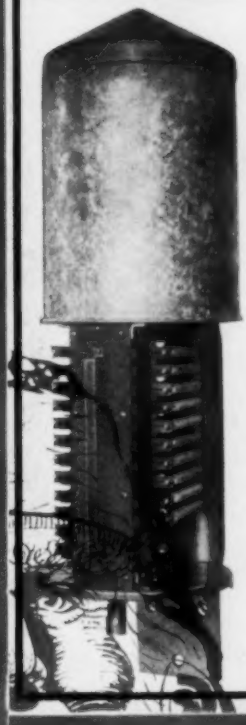


WALL
DREADNAUGHT
BLOW TORCHES AND FURNACES

Designed to withstand roughest usage, delivering maximum heat for long periods of time and operating in windiest weather. Also brass steel double jacketed compound burners. Write about the DREADNAUGHT line.

P. WALL MFG. SUPPLY CO.
3126 Penn Ave., W. S.
Pittsburgh

SINCE 1864 WALL SUPERIOR PRODUCTS



SANDS ELECTRIC CO.

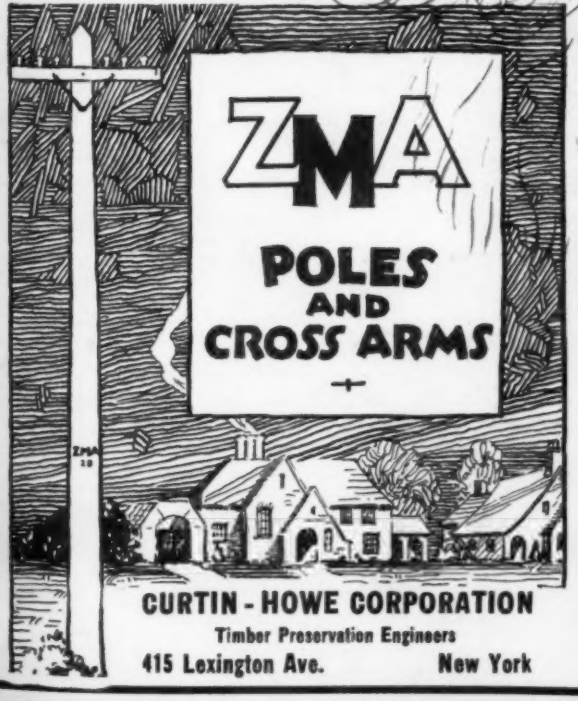
No. 35

THE BEST TERMINAL AT THE LOWEST COST

SPECIFICATION

Malleable iron bracket, zinc core box and cover, zinc panels, hard rubber insulation, large brass connecting studs, self soldering nozzle with lead cable guard, improved hood, and heavy widely spaced bronze fuse clips, mounted so that arrester blocks are not disturbed by the removal of fuses. This superior terminal with its cross connecting feature and other advantages is made in 11-16 and 26 pair sizes and is furnished with or without cable stub.

SANDS ELECTRIC CO.
NORTH CHICAGO, ILL.

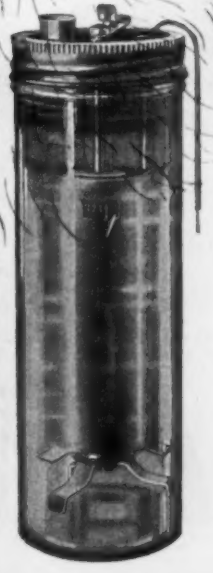


ZMA

POLES AND CROSS ARMS

CURTIN-HOWE CORPORATION
Timber Preservation Engineers
415 Lexington Ave. New York

Adaptability At Extremely Low Temperatures



WATERBURY TELECELLS

have operated at temperatures in excess of 30° below zero.

Maybe your conditions are not as extreme as this, but what would your present batteries do under similar conditions?

The Waterbury Battery Co.
Waterbury, Conn., U. S. A.

KEARNEY SPECIAL TELEPHONE EQUIPMENT

Effective! Economical! Efficient Products for

Reducing Maintenance Costs in Telephone Outside Plants

KEARNEY Non-Chaffing Cable Ring Saddles will help give your cables longer life. They provide a smooth rounded surface in contact with the cable which removes all possibility of ring cutting. They are more economical than the laborious method of wrapping lead sheath around the cable. By installing two saddles on either side of the pole, the most severe ring cutting will be eliminated. They are ideal for bridge installations where vibration is excessive.

KEARNEY "No-Rench" Anchors are the latest addition to the Kearney Anchor group. This anchor is installed by means of its own rod without the use of an anchor wrench. It may be used over and over again since it can be salvaged as a unit. Like all other Kearney Anchors, this anchor is made of certified malleable iron. Kearney Steel Rod and Pipe Rod Screw Anchors will also give you unfailing service for many years.

KEARNEY Solderless Wire Connectors are now being made in two pieces which greatly facilitates their use in the field. These connectors are the only connectors obtainable in which the tongued washer entirely surrounds the slotted bolt. For further information write for Bulletin No. 310.

KEARNEY 4-in-1 Expansion Anchors give greater holding power per dollar. They are unbreakable; easy to install; they cannot be left unexpanded; and they are hard to pull out. Simple in design and rugged in construction, they leave little to be desired in the way of patent anchors.

KEARNEY Guy Wire Clips are the most efficient and economical method of serving up strand ends. These Guy Wire Clips are now made in six sizes instead of three. A Guy Wire Clip for each size strand. These clips may be obtained in either aluminum, copper or galvanized iron. Other information will be sent on request.

JAMES R. KEARNEY CORPORATION
MAIN OFFICE
4224-40 CLAYTON AVE. • ST. LOUIS, MO.
Factories: **• ST. LOUIS, MO. • TAYLORVILLE, ILL. • TORONTO, CANADA**

KEARNEY

TELEPHONE ENGINEER, December, 1930. Volume 34. No. 12. Published monthly by TELEPHONE ENGINEER. Publication office 192 N. Clark St., Chicago, Ill. Subscription price, $2 a year in the U. S. Entered as second-class matter June 6, 1922, at the Post Office at Chicago, Ill., under act of March 3, 1879.

Messages that took 3 to 4 days now handled in as many minutes

by means of Telephone Typewriter Service

Whatever is typed on the sending machine . . .

THE AUBURN AUTOMOBILE COMPANY, whose cars are seen on almost every highway, operate two plants 140 miles apart. When the mails were used for the transmission of written data, it frequently took from 3 to 4 days to send a message and receive a reply.

Then Telephone Typewriter Service was installed. "Now," says an official of the company, "it is possible to dispatch a message and receive a *typewritten* answer within 3 or 4 minutes' time."

"Almost every department," he continues, "finds the Telephone Typewriter useful. The Sales Department uses it for sending to the assembly plant allotment notices regarding shipments to dealers. These messages are accepted as final authority to make shipment.

"The Telephone Typewriter also enables the cost department to obtain immediate information on late costs and progress records, and gives the purchasing department closer contact with stocks on hand. All messages sent and received are filed as a record of the transaction that each covers. This feature is especially valuable."

Teletype . . . the Telephone Typewriter . . . sends typewritten messages over telephone wires at a speed of 60 words a minute. The receiving machine typewrites automatically, making it unnecessary for somebody to answer before a message can be sent.

Some of your own subscribers might welcome this service

Why not get after your local manufacturers and see if you can't interest them in Telephone Typewriter Service? You will find it very profitable to lease such service, either for use between widely-separated offices and plants or within large factories. For further information write the Teletype Corporation, 1400 Wrightwood Ave., Chicago.

TELETYPE

THE TELEPHONE TYPEWRITER

. . . is instantly reproduced by the receiving machine. Machines can be used in either direction, and both make one or more copies on plain paper or printed forms.

2 NEW TYPES

Kellogg *Switchboard*

CHICA

COLUMBUS **KANSAS CITY**

KELLOGG

Masterphone

THIS new Wall Masterphone has the same pleasing qualities as the other types of Kellogg Masterphones—its design is more appealing to your subscribers than the ordinary wall phone. The simple rugged construction of this instrument assures a long life, free from trouble. The black satin-finish wall box with the Masterphone hand set makes an ideal unit for subscriber sales.

The Extension Masterphone is a real sales builder for many companies. No other phone of its type excels this new instrument in transmission and reception qualities! The induction coil, hookswitch, and connecting rack are conveniently mounted in the handsomely finished black-enameled steel box.

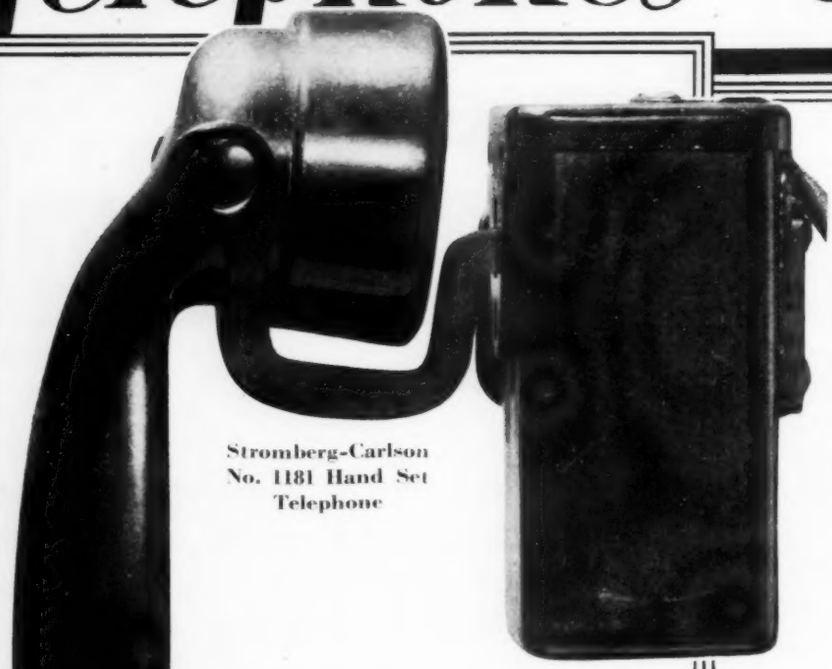
The Masterphone has won its place in the telephone world through its originality and performance. Many companies have changed their standards to include it.

rnd Supply **Company**

ICA LINOIS

CITY SAN FRANCISCO SHANGHAI

Telephones thatbr

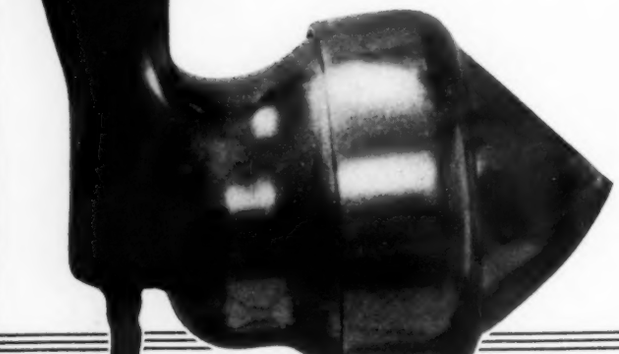


Stromberg-Carlson
No. 1181 Hand Set
Telephone

Stromberg-Carlson
No. 1168 Desk Stand
Telephone

"There is nothing finer than a Stromberg-Carlson"

Stromberg-Carlson
No. 1177 Hand Set
Telephone



Stromberg

Identify your inquiry to advertisers by saying—"As shown in TELEPHONE ENGINEER"

...at bring business,

g-Carlson
Desk Stand
hone

son
Set

PRODUCTS in popular demand bring business. Most telephone companies, recognizing this principle, have made the already popular Hand Set Type Telephone available to their subscribers.

This brings business to the operating company in two ways: first, increased revenue from rental charges, second, increased use of extension service.

When the Stromberg-Carlson Hand Set Telephone is installed, the increased rental charge is almost net profit to the operating company. This telephone furnishes efficient transmission and reception, being wired with the Booster Talking Circuit.

For extension service, there is nothing so popular as the Stromberg-Carlson Hand Set Telephone in either the desk or suspended type. It is light, well balanced, artistically designed and accepted as the "modern home" instrument.

A comparison of the Stromberg-Carlson Hand Set Telephone with any other telephone will convince you that for all around service "There is nothing finer than a Stromberg-Carlson."

Write for Bulletin 115

Stromberg-Carlson Telephone Mfg. Co.

Factory and General Offices:
100 CARLSON ROAD, ROCHESTER, N. Y., U.S.A.

Branch Offices:
CHICAGO, ILLINOIS KANSAS CITY, MO. TORONTO, CANADA

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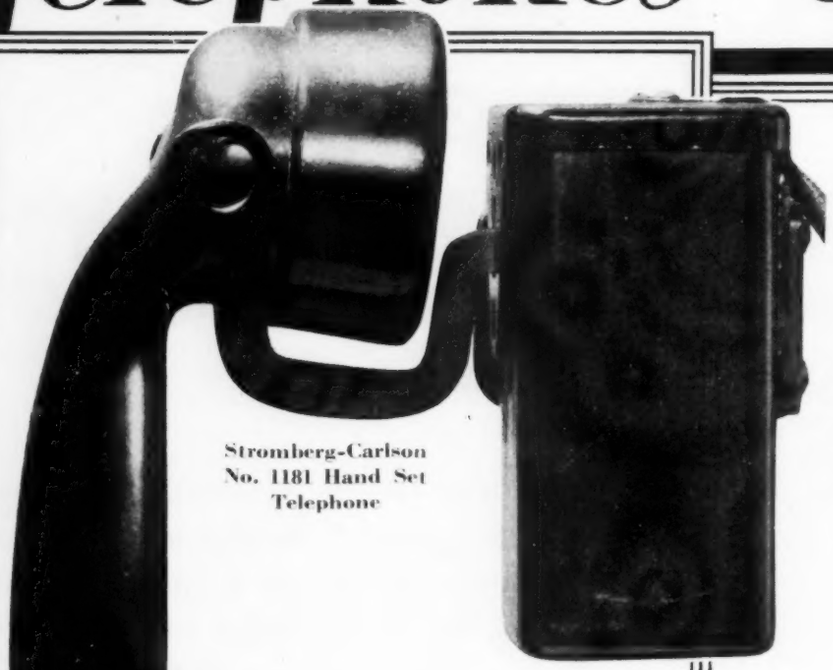
Garnett, Young & Co.,
San Francisco, Cal.
Los Angeles, Cal.
Portland, Ore.
Seattle, Wash.

Southern Representative
Scoville Mercantile Company,
Atlanta, Ga.

g-Carlson

Telephones that b



Stromberg-Carlson
No. 1181 Hand Set
Telephone

Stromberg-Carlson
No. 1168 Desk Stand
Telephone

"There is nothing finer than a Stromberg-Carlson"

Stromberg-Carlson
No. 1177 Hand Set
Telephone

Stromberg

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bring business,

Carlson
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San Francisco, Cal.
Los Angeles, Cal.
Portland, Ore.
Seattle, Wash.

Southern Representative
Scoville Mercantile
Company,
Atlanta, Ga.

g~ Carlson

SUPER-SERVICE in time of stress.

ON the afternoon of May 26th, 1930, the city of Gloversville, N.Y., suffered its most serious conflagration, nearly $100,000.00 damage having been done by the flames.

When the fire assumed serious proportions, telephone traffic increased greatly. During a twenty minute period from 2:40 to 3:00 P. M., it is estimated that telephone calls were made in greater numbers than in any period of the same length since telephone service was established in Gloversville.

. . . telephone traffic increased greatly. During a 20 minute period, from 2:40 to 3 P. M., it is estimated that telephone calls were made in greater numbers than in any period of the same length since telephone service was established in Gloversville.

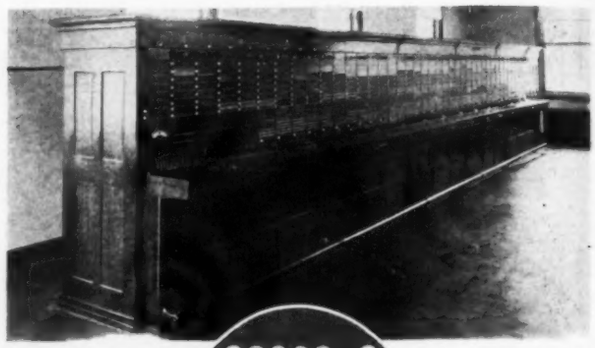
Approximately 2,100 connections were established in this period, or at the rate of over 6,000 per hour. . . . Eight operators, the usual number at 2:40 P. M., were on duty yesterday afternoon, and calls were being answered in normal numbers.

Ten minutes later and the calling rate had increased so rapidly . . . . six additional operators were on duty, every available switchboard position was occupied and calls in unprecedented numbers were being answered with the usual dispatch. . . . The telephone office was in direct path of the heavy smoke clouds from the fire and the operating room rapidly filled with smoke. The regular and emergency forces however, stuck to their duty and the telephone service was uninterrupted.

The Morning Herald, Gloversville, New York
May 27, 1930

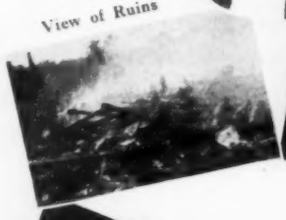
Stromberg-Carlson Engineers will gladly send you a bulletin explaining in detail why the Stromberg-Carlson Super-Service Switchboard is the most efficient and economical telephone switching equipment on the market.

Write for Bulletin 117



Stromberg-Carlson Super Service Switchboard

Gloversville, N. Y. Installation



View of Ruins

Scene at the Fire

Firemen at Work

The Fire Still Raging

"There Is Nothing Finer than a Stromberg-Carlson"

Stromberg-Carlson Telephone Mfg. Co.

Pacific Coast Representative
Garnett, Young & Co.,
San Francisco, Cal.
Los Angeles, Cal.
Portland, Ore.
Seattle, Wash.

Factory and General Offices:
100 CARLSON ROAD, ROCHESTER, N. Y., U. S. A.
Branch Offices:
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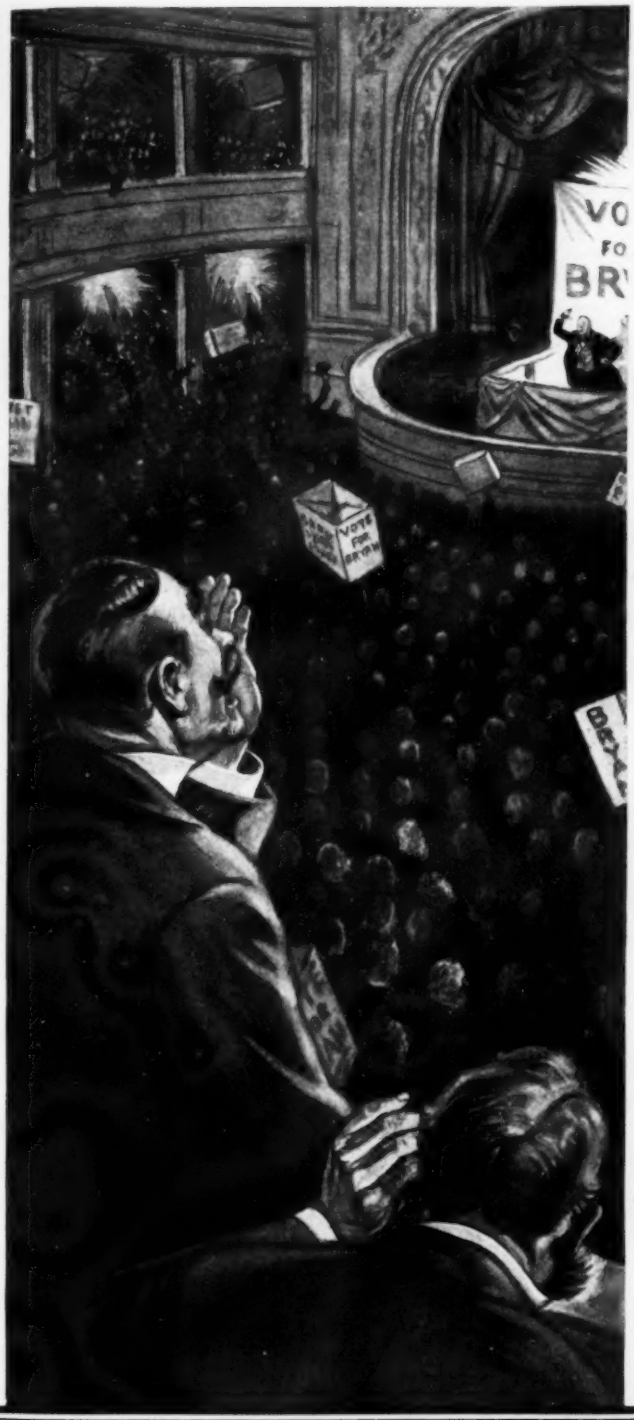
Southern Representative
Scoville Mercantile Company,
Atlanta, Ga.

Stromberg-Carlson



"Louder... louder!"

--- *a cry of the past*

Straining forward to hear the speaker they were all ears and he was all lungs—but still they couldn't understand him. No wonder "louder please"—and remarks less courteous—were bywords at old time gatherings.

That was before Western Electric showed the world how to amplify and distribute the voice. Today the Western Electric Public Address System brings every word of the speaker to you, even in the last row of the balcony or on the far edge of the largest crowd outdoors.

And this, like most achievements in voice reproduction, was made possible only by this organization's long experience in making Bell telephones.

Western Electric

Makers of your Bell telephone and leaders in the development of sound transmission

For easy hearing, the Western Electric Public Address System makes every seat a front seat.

TELEPHONE ENGINEER

192 N. Clark St., Chicago. Telephone STAte 8971

PUBLISHED MONTHLY BY

TELEPHONE ENGINEER PUBLISHING COMPANY

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Vol. 34 No. 12 December 1930.

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Waterbury Battery Co. 1

UNDERGROUND TELEPHONE CABLE

is surely worthy of the very best treatment. So, in pulling it through the duct, we suggest the use of

MINERALLAC PULLING COMPOUND

It saves the lead sheath, shortens the pulling time and cuts down expense of installation.

Ask for the folder on Minerallac No. 150

MINERALLAC ELECTRIC COMPANY
25 North Peoria Street
CHICAGO

TELERING

For Central Office and PBX Ringing

IN USE ALL OVER THE WORLD

ONE REED!

ONE CONTACT!

IDEAL WAVE FORM

REDUCE YOUR RINGING COST

ORDER ONE ON TRIAL

More power than you need

IT PAYS FOR ITSELF

Converts Commercial Alternating Current to Telephone Ringing Current

POSITIVELY NO RADIO INTERFERENCE

Very low current consumption

Price $44.00—F. O. B. Elyria
Fully Guaranteed

Sold by Leading Telephone Distributors

Telkor, Inc., Elyria, Ohio
(Write for booklet)

Here's the Most Practical Selection For Your Exchanges

THE value of a switchboard cannot be determined by its cost alone. Nor can its value be based solely on what the switchboard accomplishes. Rather, it is the ratio between these two that determines the worth of the switchboard. It is on this ratio — the only true measure — that American Electric engineers base their claim that the Monotype Community is the greatest small exchange switchboard value that telephony has ever known. Dollar for dollar — including operating and maintenance expense as well as the original investment — the Monotype Community gives proportionately better telephone service than any other manual switchboard ever offered for small exchanges.

If you are confronted with the difficult job of operating small exchanges profitably, the Monotype Community has an extremely valuable story for you. American Electric engineers will gladly make a study of your problems, without obligation to you, and submit their recommendations accompanied with actual figures. For preliminary information ask for Bulletin 104.

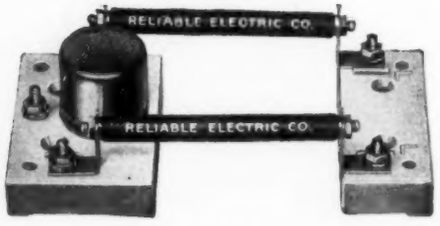
American Electric Company, Inc.

STATE AND 64th STREETS, CHICAGO, U. S. A.

Branch Office and Warehouse — 7th and Wyandotte Sts., Kansas City, Mo.
General Export Distributors — The Automatic Electric Company, Ltd., Chicago
Associated Company — Automatic Electric Inc., Chicago
West Coast Distributors — Sierra Equipment Corporation, Los Angeles, Cal.

Reliable PROTECTION

A-27 Protected
Cable Terminal



No. 977 HH Arrester
Listed as Standard by Underwriters' Laboratories

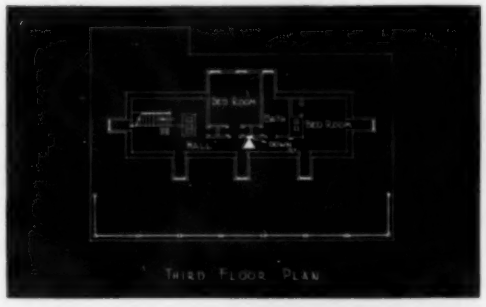
RELIABLE FUSES
RELIABLE SLEEVES
RELIABLE ARRESTERS
RELIABLE CABLE GRIPS
RELIABLE GROUND CLAMPS
RELIABLE CABLE TERMINALS
RELIABLE DISCHARGE BLOCKS
RELIABLE DISTRIBUTING FRAMES

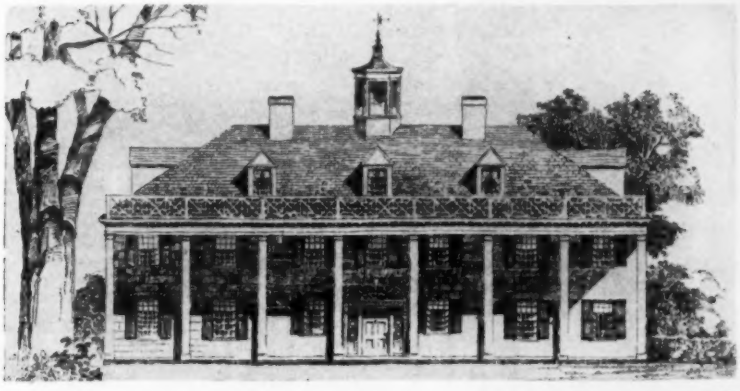
All of the Highest Quality in Design — Material — Workmanship

Reliable Electric Company

CHICAGO « « « ILLINOIS

"Just as we Plan other Modern living Comforts, we provide for Telephone Service"



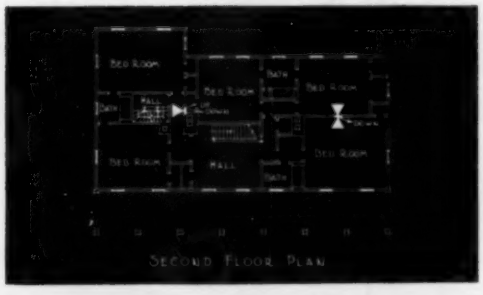


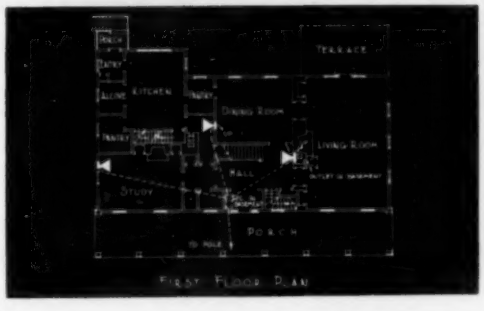
In the residence, "Mt. Vernon," Norwood Road, West Hartford, Connecticut, built-in conduit serves eight telephone outlets, including one in the recreation room in the basement. PHILIP B. WHITE, Builder, *West Hartford.* WALTER P. CRABTREE, JR., Architect, *Hartford.*

IN CONSTRUCTING homes for sale, builders find it profitable to include inexpensive features which they know will appeal strongly to home buyers. Outstanding among these is provision for *telephone convenience*. A New England builder says:

"I believe in providing built-in conduit for a complete telephone installation. Just as we plan other modern living comforts in every room, we provide for telephone service wherever it will increase the convenience of those who live in the house."

Builders may consult freely with representatives of the local telephone company in planning the telephone arrangements for new and remodeled buildings. No charge is made for this advisory service. Just call the Business Office.





The advisability of considering complete telephone convenience together with other living comforts in building the modern home is emphasized in this advertisement, appearing this month in a group of magazines edited for builders.

Cook H-36 Central Office Protector

This protector is for use in exchanges in rural sections where the distribution of light and power circuits do not form a sufficient hazard to demand heat coil protection.

The H-36 contains fuses and lightning arresters, and may be mounted on any standard distributing frame. This H-36 is a simple, inexpensive central office protector, well built and widely used.

COOK ELECTRIC COMPANY

2700 Southport Ave. CHICAGO

Telephone Engineer

Volume 34 DECEMBER, 1930 No. 12

To Serve You Better— We have endeavored this past year to make our editorial matter of real interest and value to the operating telephone man. We have received letters from many readers complimenting us on the improvement in TELEPHONE ENGINEER. We have been happy to consider these statements a reliable indication that we are not only advancing but are firmly entrenching ourselves as a vital factor in the telephone field.

We can say without boasting that we have outlined for 1931 one of the most interesting programs ever thought possible. Each issue will contain absorbing material, every word of which will lead toward advancement for the man who reads it.

A complete course in *Telephone Engineering and Management* by a well known engineer and writer will cover basic theory, design, construction, maintenance and management of telephone exchanges. It will be clearly written and easy to follow, and should prove of real value to managers and wire chiefs of medium and small sized exchanges. Each monthly installment will include ten problems for your solution.

In the course of exchange operation, troubles of different kinds make their appearance, some of which are very simple while others are rather puzzling. For those who are baffled by trouble we will run a *Technical Clearing House*. Here your difficulties will be solved and the information on how to overcome or correct the trouble will be passed back to you by a competent technical engineer. No matter how tough your problem may seem, give us a chance. This is a service we believe will be welcomed.

Each issue will contain technical articles by such writers as F. J. Dommerque, E. R. Collins, B. C. Burden, Ray Blain, and others. We believe you are already familiar with their writings and will look forward to the subjects they have planned for next year.

Radio has made many contributions to the telephone field and one of the most important is the Vacuum Tube. A series of articles will be devoted to the general theory of Vacuum Tube circuits which will describe the various applications of the vacuum tube to the telephone industry. The increasing importance of the vacuum tube in the telephone business warrants every man keeping posted on this subject.

Your source of income comes from the telephone business. Therefore we aim to keep you posted on current financial activities, important industrial changes, and new products that will have a bearing on tomorrow's service, so that you can get the greatest possible benefit and increase your revenue to the maximum.

We believe that every reader of TELEPHONE ENGINEER will be elated at the many good things he will find and will look forward month to month for the next issue with the greatest of interest. We have mentioned some of the features for 1931 to give you a little insight into what we believe will be the finest editorial program in the telephone field.

Save your copies; they will be well worth binding, to be kept for future reference.

Shall Regulation Be State or National? Where will regulation of public utilities finally be placed? Will all public utilities be governed by the same laws and rules of control? And will the danger of public ownership increase or diminish?

There are three interrogatories of almost universal concern to telephone property owners and operators. They are, indeed, of serious moment to utility investors as well as utility patrons. And to intelligently try to answer them is a risk that no one of experience with statesmanship or human nature will assume without misgivings. The why and the how and the sum total of the public utility business is in the hands of members of legislatures and congressmen. Some of them know something of the business they seek to control and some of them

know nothing of it except as it affects their pocketbooks. And this latter they take as their guide to legislation. So what of the future? One guess is as good as another. And here goes ours.

The regulation of public utilities, except as to interstate business, will remain with the state legislatures. The people have learned, to their satisfaction, that the farther control is removed from those affected by action of government the more likely will the people get the worst of it. And the business interests of the country have learned that the more government "muscles" into business the more business is hampered and taxed and bound up in expensive red tape. So neither public nor business wants the Federal Government to manage trade and commerce beyond such regulation as will guarantee all the rights of property that our constitution provides.

And will all utilities be governed by the same regulations? Not if public utility service of different kinds is to provide adequate and equitable service to the various needs and a flexibility that will make owner and patron common interest promoters. Regulations for railroads and power generators and distributors will never adjust with telephone and telegraph communication service, but if some politicians have their way they will try to cut and fit regardless of results.

The danger of public ownership depends largely on the conduct of public utility management. If the privately owned utilities give good service at reasonable rates there will be no public ownership for it is well known that public ownership and public management of utility service is not and never can be as economical and efficient as private ownership with its employees holding their positions by service merit rather than ever changing politics. But if utility management resorts to finance kiting and tricky manipulation of vested privileges, or ignores the just responsibilities of those given legislative license to conduct a semi-public business with honor and fairness, then the public is liable to step in and attempt to protect itself by establishment of government ownership.

Hence the more we adhere to the four square in the management of our business the less liability there will be to government interference with an industry that can unquestionably be most successfully conducted as private enterprise.

Telephone Earnings in the Abstract

In an address before a recent national gathering of industrial leaders, one of the speakers declared that too many business enterprises are groping in the dark. He said this could be explained by the fact that most business managements are completely lacking in a comprehension of the fundamentals of security and success. These fundamentals, according to this speaker, consist of a knowledge of the costs of conducting a business, these costs to be used as a basis of fixing prices which will make a living profit.

In other words, he insisted that there must be a laboratory for receipt and expense analysis in every business that is safely managed. This analysis must be conducted scientifically, and not haphazardly, he said.

The speaker was not in the telephone business, but his logic may be applied to any enterprise. Let us look into our own industry. Telephone engineers, after prolonged research into the costs of operation in variously sized plants, have agreed that a minimum annual earning should be thirty per cent of the average telephone plant investment.

To illustrate, here is a table of operating cost percentages which may be considered roughly as a reliable basis for calculating earnings reasonably necessary to produce satisfactory results in a well managed plant:

Interest on investment, 7 per cent
Wages and salaries, 10 per cent
Depreciation, 5 per cent
Local taxes, 3 per cent
Government taxes, 1½ per cent
Maintenance, 3 per cent
Incidentals, ½ per cent
Total, 30 per cent

There are engineers who contend that thirty per cent is not sufficient for full protection when casualties, to which our property is subject, are taken into consideration. They fix thirty-five per cent as the minimum. It is obvious that an annual earning of thirty per cent on the plant investment is none too much, and that those who do not fix their budgets accordingly must compensate in some manner, perhaps by placing their depreciation reserve on their books rather than in the banks, or by skimping their wage and maintenance allotments to a level below that necessary to insure continued efficient service.

The other items of annual expense are unavoidable and the management which does not take them all into full account is paving the way for a run down plant, or the probability of deferred interest on investment unless there is a boom in the telephone business, a prospect which now seems rather remote.

Functions of Trunk Circuit Common Relays

Functions of the First Eighteen Relays of the Common Trunk Circuit in the Straightforward Trunking System Are Here Described by John H. Levis, Jr., Telephone Engineer, Rochester, New York, in the Sixth of His Series of Articles Appearing in This Publication.

The following paragraphs describe the functions of the first eighteen relays of the common trunk circuit in the Straightforward Trunking system. Reference should again be made to the circuit diagram of the complete Straightforward "B" trunk circuit which was published in the October issue of TELEPHONE ENGINEER.

The diagram of relay symbols, accompanying this installment, shows the first eighteen relays in the common circuits and gives them their position in the circuit according to number location and also shows their respective direct current values. These relays are also shown in the same position as they are placed in the diagram of the complete circuit. This enables the reader to determine the resistance of the windings involved in the various wiring connections.

All relays that are shown connected to the star terminals, other than on the trunk circuit proper, are the common relays and are common to the entire position of forty trunks. All such common wiring to the trunk is shown by dash lines.

Relays

1 33 Cycle Master relay operates from 33 cycle key.
2 50 Cycle Master relay operates from 50 cycle key.
3 66 Cycle Master relay operates from 66 cycle key.
4 16 Cycle Master relay operates from 16 cycle key.
5 Non-ring Master relay operates from non-ring key.
6 Busy tone Master relay operates from busy tone keys.

All the above master relays are of the slow release type and make the proper selection of the relays in the trunk circuit. They also operate the releasing relay so that the trunk can be pre-selected and another call cut in.

7. *Pre-select Busy Tone Master Relay*

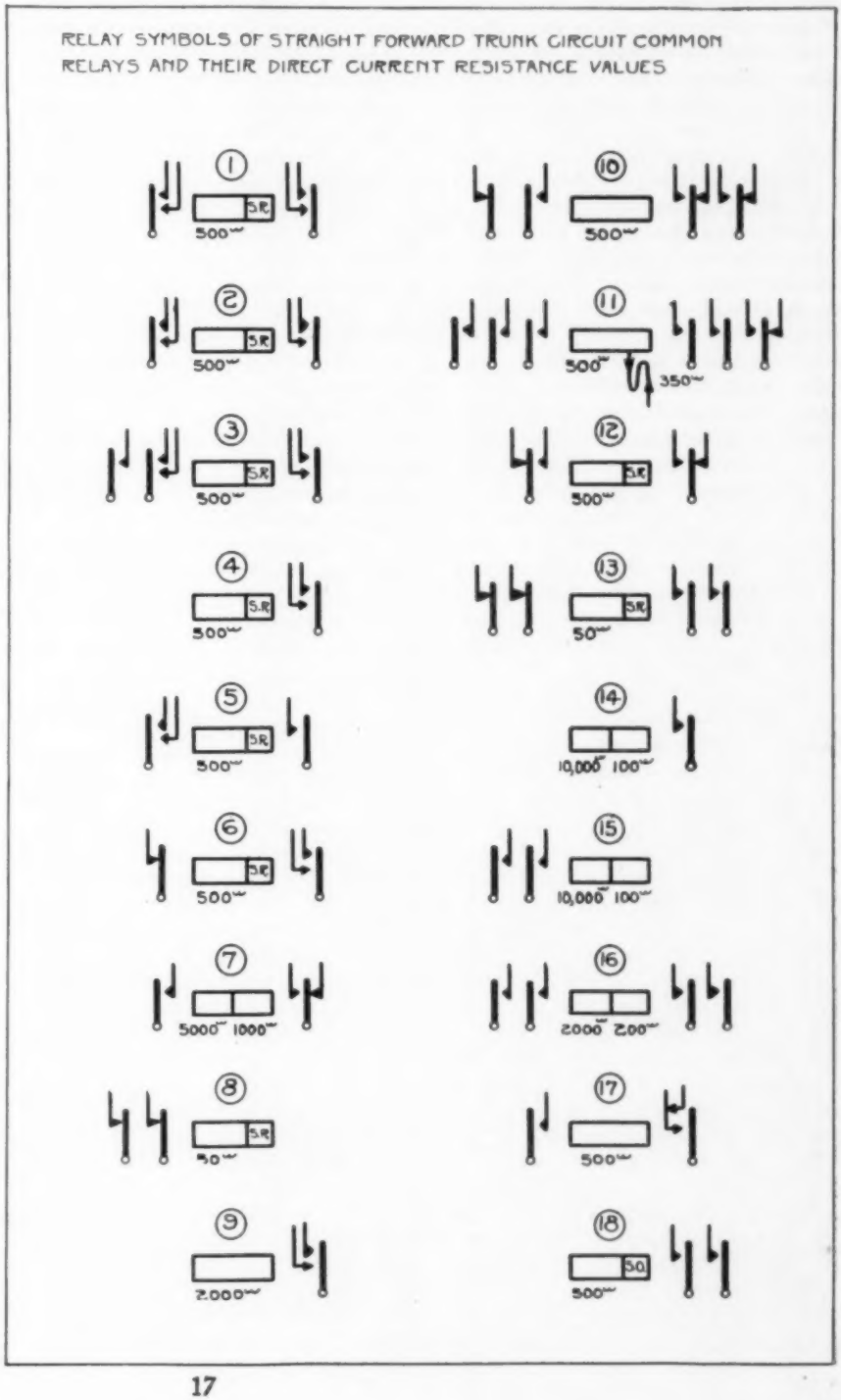
When an incoming call has been preselected, i. e., ringing selected and with the operator cut on to another circuit, the number seven relay operates, opening the starting wire from the master busy tone relay number six, so that should the line called for be busy (i. e., the trunk that is pre-selected) and the operator operates the common busy tone key, the tone will be set up on the pre-selected trunk and not on the trunk on which the operator is cut in. In other words, this relay prevents the busy tone from being placed on a trunk not wanting same.

8. *Master Common Key Relay*

This relay is used to eliminate break contacts in the common start keys. It is used to unlock the common equipment that is holding the operator's cut-in relay number ten in the trunk circuit. This only holds true when a call is answered with the emergency listening cut-in key.

9. *Call Passing Tone-Start and Master Control Relay Cut-in*

This relay closes the circuit that starts the common two pulse tone call passing



tone relay circuit and also operates the number eleven relay that connects the common master key relay circuits to the trunk circuit commons. The circuit for this relay is closed by a relay operated from the trunk after the operator's cut-in relay number ten is operated.

10. *Common Operator's Cut-in Relay*

This relay cuts the operator in on the trunk circuit after the final pulse of the call passing tone relay. It also opens tone repeating coil from across operator's circuit and releases call passing tone pulse relays so that same will be ready for another cut-in on trunk. This relay is locked up from relay number nine as long as the operator is on a trunk circuit.

11. *Common Master Split Relay*

This relay closes all the master control circuits from the master start relays to the trunk circuit relays and is arranged so that when any common key is operated the release of this relay is started and when it is completely released, it cannot come up again even if the operator holds the start key operated. It also will stay non-operated as long as the master start slow release relay is operated. The reason for this is that the trunk circuit is designed for pre-select ringing and, therefore, if the pre-select condition from the start key is held on the start commons and a new call is cut in, the trunk just cut in also will pre-select at the moment of the cut in. This condition will not allow the trunk operator to remain on the trunk circuit.

12. *Start Sequence Control Relay*

In order that calls coming into the trunk position can be handled in some order, the operation of cut-in is from left to right or from one to forty. When a trunk is selected the number four relay of the trunk circuit proper must receive battery current through its 2000 ohm winding to the ground of the number three relay in the trunk so that it may operate. It is this relay that controls the number four battery circuit. This circuit only functions when just one call is in on a trunk. Should another call come in to the right of the first circuit cut in, the second and succeeding calls to the right up to forty will receive their battery current for number four relay operation through the number four relay, which is operated to the left. In other words, on all calls that come in to the right of the first one in, all number four relays operate, on the other hand, on calls coming in to the left of the first one, the number four relays do not operate until the number twelve relay releases. This relay is slow to release. It controls the sequence continuity indicator white lamp. This lamp indicates that all the continuity contacts of the number four relays are making and the start cut-in circuit is closed. It is lighted at all times when no calls are in the position unless the circuit for same is open.

The relay, when operated, establishes a battery connection to the number thirteen relay contacts, which are open, due to the fact that the number thirteen relay is being operated.

13. *Start Sequence Control Relay*

This relay is operated from the number ten trunk circuit operators' cut-in relay through the number four sequence relay. It operates the number twelve common relay. When this relay is operated, the operator is cut in on the same trunk circuit. It will be noted that the break contacts of the relay are connected to the first or number one trunk circuit number four relay at the left pick-up circuit for the number four relays. As all trunks coming in on the number four relays operate to the right and none coming in on the left operate when number twelve and thirteen relays are operated, this relay is slow to release when one circuit to the other cuts in. The reason for this is because the number four relays release as the trunks are pre-selected. When the last trunk to the left is released (the number four relay) it will be noted that the number thirteen relay releases slowly, giving enough time for a complete release of the last number four relay. The break contacts of the number thirteen then close, making a battery connection to the first number four relay to the left that is free to be cut in. This keeps the cutting in of circuits in sequence and when the number four relay operates under this condition the same circuit controls prevail as described under relay number twelve.

As the number twelve relay is slow to release and as it is operated from number thirteen, also slow to release, the right hand pick-up battery for the number four relays is held open. In all cases the number thirteen relay re-operates before number twelve releases, insuring proper sequence control.

14. *Sequence Continuity Indication Lamp Relay*

The purpose of this relay is to indicate if the break contacts of all the number four relays in the trunks are making contact. When the trunk position has no calls in this relay it is operated and the red lamp indicates continuity. This relay operates from the number thirteen relay winding. The number fourteen indicator relay is 10,000 ohms resistance in order that the number thirteen will not operate through it. The red lamp flashes when the trunks cut off one and into another circuit. When the "B" position is non-occupied by an operator, this lamp is not lighted, indicating such a condition at the relay rack where the two indicator lamps are located. The white indicator lamp under non-occupied conditions remains lighted. (Please note the following error in the wiring diagram published in the October issue of TELEPHONE ENGINEER. The wiring from the lever springs of the number four relay of the first trunk should be connected to the normally made back contacts of the number thirty-one relay and not to the front contacts as shown. All other wiring of number thirty-one relay remains as shown.)

15. *Meter and Tone Control Relay*

This relay closes the operating circuit for the Automatic Peg Count Meter and in most "B" positions there are *four one* meter for each ten trunks. A meter pilot, common to the position, acts as an operator's cut-in pilot as well as a meter operation indicator. Four number fifteen relays per position are used.

The number fifteen relay has a 10,000 by 100 ohm winding. When a trunk call is cut in, this relay operates from the winding of number sixteen relay which is 2000 ohms by 200 ohms resistance.

The number fifteen relay also closes the call passing tone circuit to the tone repeating coil under certain conditions.

When a circuit is cut in, the number sixteen will not operate through the 10,000 ohm winding of number fifteen relay but number fifteen operates.

16. *Cut-in Key Control Circuit*

When the sequence control relays fail to function and the cut-in key per trunk is used to cut in on a circuit, the number thirty relay, which is 100 ohms resistance, is placed in the key cut-in winding circuit of the number ten trunk circuit relay which is connected to the 2000 ohm winding of number sixteen. This operates both the numbers thirty and the number sixteen relays.

When number sixteen operates, it causes number seventeen relay and number eighteen, slow operating relay, to function, which closes a circuit through a battery coil and through the 2000 ohm winding across the 2000 ohm winding of number sixteen. This causes number ten to operate. Number eighteen also closes the circuit to the ground of relay number eight through number sixteen contact to number fifteen winding, shorting out the high 10,000 ohm winding and leaving the 100 ohm winding of number fifteen in the circuit when number ten operates in the trunk. Number thirty is in parallel with the 100 ohm winding of number fifteen when both are operated. The call passing tone then closes when number fifteen operates, as number thirty may be held operated for a considerable time due to key operation.

The opening of number thirteen at number seventeen is used in case a trunk has been standing in for some time and the sequence circuits are not picking it up. Under this condition the operator operates the cut-in key and cuts in manually on same. Any trunk that is previously cut in on the position will drop out. This is caused by the releasing of number thirteen relay when number seventeen operates, eliminating overlapping

of circuits. The operator operates regularly under this condition and, as soon as this emergency cut-in is released by the usual methods, the number eight relay operates from the start keys, removing the low resistance ground from number fifteen and causing the 10,000 ohms to be placed in series with the winding of number ten trunk circuit relay. This causse the number ten relay to release and as a result numbers fifteen, sixteen, seventeen and eighteen relays release, allowing them to set for subsequent cut-ins. The operator will again cut in on the trunk that was temporarily cut off. This keeps the circuits that are waiting in the position to hold their places.

Relay number seventeen is introduced into the circuit in order that the path for number thirteen opens before the operating path for the number ten relay is closed by the slow operating relay number eighteen.

When a trunk comes in permanently on a position, the foregoing feature makes it possible for the trunk operator to proceed on a listening key basis until the trunk in trouble can be opened up.

Mention should be made of the fact that, with one exception, when a cut-in key is operated at a time a trunk plug is up in a line and when the operator desires to listen in or supervise a conversation on the trunk, the cut-in of the operator will cause the same operation as has been described in the preceding statements. The exception is that in this case the call passing tone will not go onto the circuit, eliminating the possibility of disturbing the conversation on the trunk.

It will be noted on the circuit diagram that the operating path for the number fifteen relay is open at the number two relay in the trunk circuit, which is operated by the called station. In the case of the "B" operator supervising, it is necessary to hold the non-locking cut-in key operated because the number ten relay of the trunk will not lock in (described in conjunction with emergency cut-in). Number thirty relay is operated and number fifteen relay is non-operated in supervising, therefore, the passing tone is open.

The number eighteen relay is slow to operate, because, when a cut-in key is used, thus cutting in another circuit, the circuits that cause the cut-in of the trunk on which the cut-in key is used, must be delayed in their operation. This delay is necessary in order that the first circuit cut in and the other common circuits involved will have time to clear out.

17. *Releasing Cut-in Relay*

Described in conjunction with number sixteen relay.

18. *Emergency Cut-in Control Relay*

Described in conjunction with number sixteen relay.

FOREIGN TELEPHONE MEN VISIT PENNSYLVANIA EXCHANGES

Officials of the Copenhagen Telephone Company, Copenhagen, Denmark, recently visited the Peoples Telephone Corporation, in Butler, Pa., one of the larger and more prominent independent telephone companies in Pennsylvania.

The foreign visitors are in the United States for the purpose of investigating outstanding telephone plants in the country, with special reference to small unattended automatic exchanges.

While in Butler the Danish telephone men were the guests of Arthur C. Black, secretary and general manager of the Peoples Telephone Corporation, and visited the modern city automatic type exchange there.

Later they were shown the small exchanges at Bruin, Nixon and West Sunbury.

Mr. Black and his associates have been pioneers in the small automatic exchange field and considerable development work has been done by Peoples Telephone Corporation engineers. They installed their first automatic exchange at Nixon in 1921, and later exchanges were installed at Bruin and West Sunbury.

Members of the Danish party included P. V. Christensen, chief engineer, H .C. Norup and V. Clausen, assistant chief engineers of the Copenhagen company.

PIONEER TELEPHONE MAN DIES

Wilton L. Richards, who joined the telephone industry in its earliest days, died November 7, at his home at 11 South Oxford St., Brooklyn, N. Y.

Mr. Richards first entered the industry in the Boston shop where the telephone was born, two years after the first public demonstration.

Later he designed various forms of magneto transmitters, hand telephones, headsets, operators' telephones, and a special form of treater transmitter, the ancestor of the present loud-speaker microphone.

In 1893 as engineer-in-charge, Mr. Richards supervised the American Bell Telephone Company's exhibit at the World's Fair in Chicago, and in 1911 he supervised the collection of telephone equipment of historical value, now housed in the Bell Laboratories, New York.

START $50,000,000 UNDERGROUND PROGRAM

Construction of a $3,000,000 underground long distance telephone cable to connect Oklahoma City and Dallas, Texas, is now under way, according to R. J. Benzel, general manager, Southwestern Bell Telephone Company. Work on the Oklahoma part of the project will begin December 15. The section will be started at the Red River about 15 miles south of Durant. About 150 men will be employed. The cable will extend from Dallas to Holdenville where it will meet underground cables which already connect Tulsa, Oklahoma City and Holdenville. The new underground cable will guard telephone patrons against interruptions of service by fire, storm or flood. The project will include construction of a building for equipment at Wapanucka, valued at $220,000, which will contain "repeaters" to amplify the voice-carrying current through the cable. Other "repeaters" are to be installed at Holdenville, Oklahoma City, Shawnee, Stroud and Tulsa. This is part of a $50,000,000 underground cable construction program which will be carried out by the Southwestern Bell Telephone Company in the southwest within the next five years. Five million dollars of this amount is to be expended in Oklahoma.

GIFFORD PREDICTS PERIOD OF UNEQUALED PROSPERITY

A period of unequaled prosperity is soon to arrive, according to predictions of Walter S. Gifford, president, American Telephone & Telegraph Company, in a speech before the Essex Institute at Salem, Mass. "As sure as I am standing here," Gifford said, "this depression soon will pass and we are about to enter a period of prosperity the like of which no country ever has seen before; a new era of big business working for the fulfilment of its social obligations, a new development in industry to work out the problems of distributing what we have, on the basis that we have plenty to go around."

MINNESOTA TELEPHONE MEN TO CONVENE

The Minnesota Telephone Association will hold its annual state convention at the Hotel Lowry, St. Paul, January 27th, 28th and 29th.

ARGENTINA TELEPHONE COMPANY PLANS EXTENSIONS

It is reported from Parana (Entre Rios) that the Compania Entrerriana de Telefonos has commenced to give effect to an important extension of its system. Six thousand meters of underground cable are to be laid in Parana, bringing the total of the underground system up to about 14,000 meters. A central automatic exchange with capacity for 4,000 subscribers is to be installed. The company also intends to erect a new building for its offices in Parana. It is announced that direct telephonic communication between Concordia and Buenos Aires will be available soon.

Direct telephone service between the cities of Parana and Concordia has already been inaugurated by the Compania Entrerriana de Telefonos.

Principles of the Automatic Telephone

E. R. Collins, Manitoba Telephone System, Brandon, Canada, Discusses Actual Experience with the Strowger System in This Article, the Thirty-Ninth of a Series Prepared Exclusively for Telephone Engineer

The previous chapters of this series have been dealing with the "Fundamentals of Electricity and Magnetism as applied to Telephony," leading into a discussion of the main operating principles of the Strowger Automatic Type Telephone System. We have discussed this particular system, as it is most generally used for the average city service.

The One Hundred line system we have already found out consists of 100 line switches, a master switch, and two or more connector switches. This system can be enlarged into a 1000 line system by placing a selector switch between the line switch banks and the connector switch. The connector switch is driven by two sets of impulses, the first set to give the vertical motion to the shaft, and the second to give the rotary motion to the shaft. In the selector switch the vertical impulses only are supplied from the dial. The rotary impulses are set up either by the switch mechanism, individual to each selector, or else by a common impulse machine, common to a group of selectors. We will describe the former type.

In Fig. 300 you will see a line switch associated with a selector switch. For simplicity, only the equipment necessary to give the selector its vertical motion is shown in this drawing. In the line switch to the left of the drawing, only the line relay and the B. C. O. coil winding are shown. On the B. C. O. coil there would also be the pull down winding to operate the line switch plunger. But this is omitted for simplicity. The telephone would be connected to the positive and negative lines, battery being supplied from the line relay (LR-1) through the B. C. O. contacts. The receiver being removed, battery from the line relay coil flows to the telephone over the B. C. O. contacts. This energizes the pull down coil not shown, pulls in the plunger, and also the B. C. O. armature. This extends the line switch over the three trunk wires, *positive, negative* and *release,* to the line relay of the selector (LR). This in turn operates the release relay of the selector, grounding the release trunk back to the line switch B. C. O. While this operation had been taking place, the line relay (LR-1) has held on, as it is a slow release relay.

Note—(The two lines drawn beside the coil (LR-1) indicate that this coil is slow release type. The core is not shown and this will also be noticed in regard to the B. C. O. winding. This convention indicates an inductive winding, that is one with an iron core, and the addition of the two lines indicates a slow release feature.)

As soon as the shaft has lifed one step, the off normal (O. N. S.) switch contacts are closed. This prepares a circuit for the release magnet, but the release relay being operated this circuit is still opened. When the subscriber's dial is turned, the circuit for the windings of the line relay (L. R.) is opened, and naturally its armature falls back. When in this position a circuit can be traced from negative battery at the vertical magnet through the winding of the series relay, make contact of release relay, to ground at the normal contact of the line relay (L. R.). This causes the vertical magnet to keep step with the impulses from the dial as relayed by the contact of the line relay LR. During these impulses, the series relay will be energized and will remain so during the passage of the whole train of impulses, as it is a slow release relay. The spring assembly of this relay is very light. This permits a relay of relatively few turns of coarse wire, and a short slug of copper to give the slow release effect.

Convention Schedule

South Dakota Telephone Association, Sioux Falls, Jan. 13, 14 and 15, 1931.
Minnesota Telephone Association, Hotel Lowry, St. Paul, January 27, 28 and 29, 1931.
Nebraska Telephone Association, Lincoln Hotel, Lincoln, February 10, 11 and 12, 1931.
Texas Independent Telephone Association, Forth Worth, Texas Hotel, March 17, 18 and 19, 1931.
Iowa Independent Telephone Association, Hotel Fort Des Moines, Des Moines, April 7, 8 and 9, 1931.
Pennsylvania State Telephone & Traffic Association, Hotel Penn Harris, Harrisburg, May 26, 27, and 28, 1931.

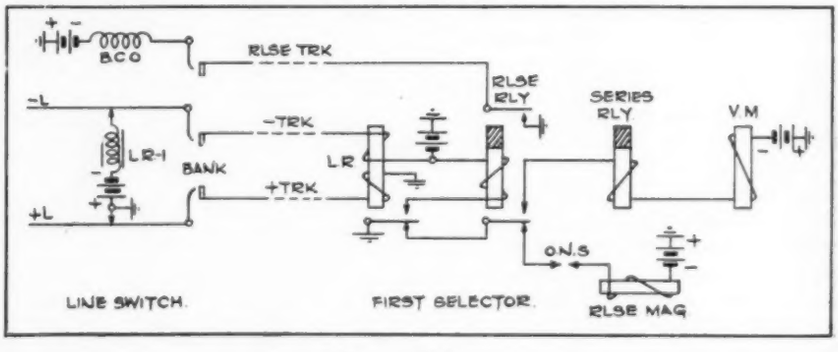


Fig. 300

Series Relay

In Fig. 301 we have shown the spring assembly of the series relay. Position 1 shows the arrangement of the springs when the relay armature is pulled in. Springs 1 and 3 are making contact. Spring 3 is the traveler spring controlled by the armature.

Position 2 shows the arrangement of the springs when the armature is partly released. Here the three springs are all in common contact. Then as the armature completes its release travel we have the arrangement shown in Position 3, and we have springs 1-2 in contact. Due to the slow release feature this action is comparatively slow as compared to the travel when the relay is first energized. It is quite important to keep this spring assembly clearly in mind as it is the key to the rotary motion of the selector.

Rotary Magnet Action

In Fig 302 we have shown the rotary magnet with its armature, and pawl, and their relation to the rotary hub of the selector switch. The vertical magnet is in series with a pair of contacts which in turn are operated from an extension of the rotary armature. This is so adjusted that the contact is broken just as the double dog tooth drops into position behind a tooth of the rotary hub. If the hub was supplied with a complete circle of teeth, and the armature interrupter springs were properly adjusted, the rotary hub would be driven around continuously as long as battery is supplied. We find this action in rotary line switches which have been briefly described in a previous chapter.

Rotary Magnet Control

In Fig 303 we have added the relays to

control the vertical and rotary motion of the switch. Assume that the vertical impulses are coming from the contacts of the line relay (LR). The series relay will be operated and its springs in the position 1, Fig. 301. The off normal contact will be closed after the first vertical impulse. Then the vertical impulses cease. Here the series relay armature releases to position 2, Fig 301. Now battery from the rotary interrupter relay (RIR) flows over the closed, off normal contact to the ground at the series relay, while its springs are in Position 2, Fig. 301. RIR armature pulls up and closes a circuit from its own winding through the rotary magnet contact to ground at its own contact now closed. This holds the RIR operated even after the series relay springs have reached Position 3, Fig. 301. When this position is reached Spring 1 of the series relay completed a ground from battery at the rotary magnet through closed contact of relay RIR to ground at the normal contact of the series relay. This gives 1 rotary impulse to the rotary magnet, driving the wipers in on the first contact of the level selected by the vertical impulses. The interrupter springs of the rotary armature have opened the circuit to the RIR, which being of a stiff adjustment, releases very quickly. This breaks the circuit to the rotary magnet, which releases, closing the interrupter springs again. Now since the series relay is normal at this period, the rotary interrupter relay does not find ground to pull up as in the first instance. But we have shown the first bank contact (this is of course the private bank) grounded. Now a circuit can be traced from the RIR battery, off normal contacts, interrupter springs now closed, normal contact of switching relay, private wiper to ground at the first private contact. This causes the RIR to pull up again, closing the circuit for the rotary magnet to ground at series relay. This drives the wiper to the second contact of the bank which is also grounded, and so the rotary action is repeated until the 6th contact is reached. Here there is no ground on the contact, and when the rotary interrupter springs close after the 6th impulse, the private wiper is on an open contact.

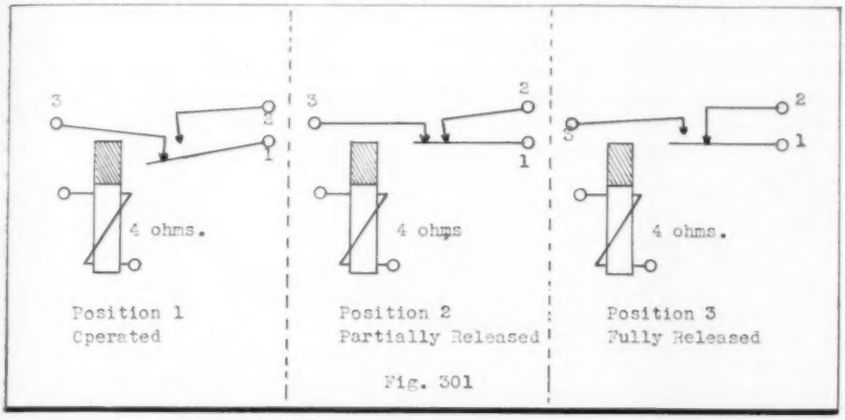


Fig. 301

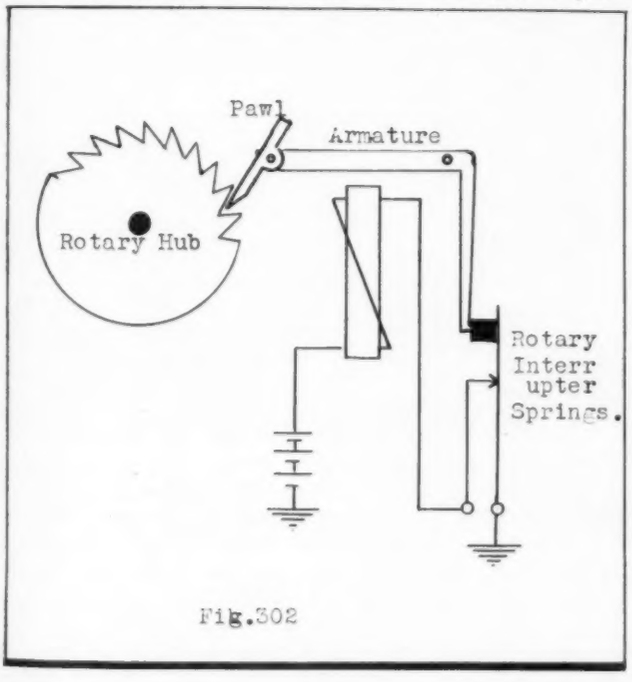


Fig.302

Switching Relay

When the private wiper reaches the 6th contact it finds no ground. However, the battery from the RIR will find a completed circuit through the winding of the switching relay winding, which is 1300 ohms. We already mentioned that the RIR had a stiff spring adjustment. It will pull up with a dead ground but not through 1300 ohms resistance. Therefore the rotary interrupter relay does not operate again. Now you will notice that the lower end of the switching relay winding is grounded. Also the upper end of the winding has been grounded, first from the springs of the series relay. Due to the make before break action of these springs this ground was continued until the RIR placed a guard ground through its contacts when closed. Thus the switching (Sw.) relay has been grounded at both ends of its winding. There would be no difference in potential between the terminals of the Sw. relay, so it will remain inoperative. Again note that the private wiper reaches the first contact before the interrupter springs break the circuit to RIR. Thus the ground potential of the upper terminal of the Sw. relay is maintained constantly during all these changes until the 6th contact is reached. Now trace from the lower terminal of the Sw. relay and you will find the only circuit is through the RIR winding to battery. Then but not till then the Sw. relay pulls in, but RIR does not owing to its stiff adjustment. The Sw. relay contacts now place a ground on the private wiper and then the 6th bank contact is grounded from the Sw. relay. Now any other selectors driving over this level will find the first six contacts grounded and will naturally move on to

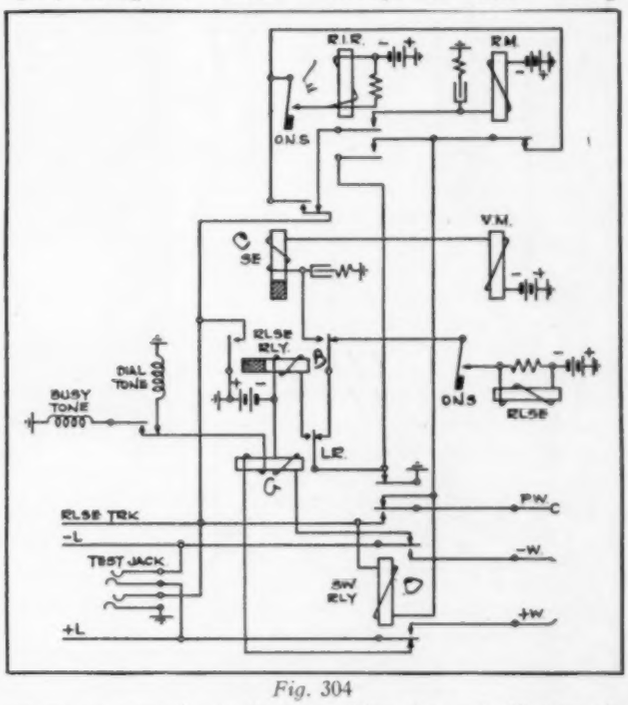


Fig. 304

the 7th contact.

The speed at which this rotary action takes place is so great that unless the student follows each step closely and understands the action, he would not be able to follow the action that takes place.

Complete Selector Circuit

In Fig. 304 we have a complete circuit of the selector. A short review of the steps through this switch may not be amiss. The positive and negative and release trunks come from the line switch as shown in Fig. 300. The subscriber removes the receiver and the line switch extends its line to the selector. Battery now feeds from the line relay (LR), Fig. 304, back to the telephone. LR pulls up and closes a circuit to the release relay. Release relay operates and grounds the release trunk back to the line switch holding in the BCO coil. The release relay also prepares the impulse circuit from the line relay to the vertical magnet. Impulses operate the armature of LR, opening the circuit to the release relay. But this is a slow release coil so that it remains operated during the impulses. Battery from the vertical magnet flows back through the series relay, make contact of release relay, to ground at the line relay for each impulse. As soon as the shaft is lifted one impulse step the off normal switch closes. This is shown in two places on the drawing but really is in one spring assembly. The release magnet circuit is now connected to the break contact of the release relay, so no circuit is completed. The other pair of off normal springs close the circuit to the line relay. This relay pulls up during the vertical impulses. If you will follow the circuit of the switching relay now you will see that there is a short circuit across its windings. From the upper terminal of Sw. relay, to make contact of the series relay, interrupter springs of rotary magnet to lower terminal of the Sw. relay. This prevents this relay from operating during the vertical impulses.

The vertical impulses cease and the series relay releases. The RIR relay has been pulled in from ground at the release relay but the rotary magnet circuit has been held open by the contacts of the series relay. When these contacts close the battery flows from the rotary magnet, causing it to operate. The series relay contacts return to normal, but the RIR relay has locked its coil through the interrupter springs, to ground at the Sw. relay. When the interrupter springs open they break the lock to RIR and it releases.

The rotary action is repeated as described for Fig. 303 until the 6th contact was reached. Also note during the rotary impulses in reaching this contact, the switch relay has remained shunted out. When the 6th contact is reached the switching relay operates, and connects the positive and negative lines from the telephone to the contacts of the bank selected. Here it will be noticed that the battery supply which forms the line relay is cut off from the telephone. It is assumed that there is another switch, either a connector or selector wired to the bank contacts selected, and the battery for the telephone is supplied from the next switch.

The LR and the release both release. Now the ground for the contacts of the line relay is supplied from the contact of the switching relay. Therefore when the Sw. relay pulls in it removes this ground. This prevents battery from the release magnet operating the release mechanism. The selector is now held, and is consuming current only through the winding of RIR and the Sw. relays in series, with a total resistance of 1510 ohms, which for 48 volts gives a current flow of about 30 mills.

The ground for the LR relay is supplied through a common induction coil. When the subscriber picks up the selector he hears a special tone supplied through the induction called a trunk tone. For certain cases this is necessary to let the subscriber know that he has a selector at his disposal. As soon as the switch cuts through, however, the tone disappears as the switch following would not have a tone supply. It is of course quite necessary that the connector supply battery for talking purposes is absolutely free of any tone or other noises.

If on the other hand the whole 10 contacts of the selector level choses should be busy, the rotary magnet will drive the shaft until the wipers in 11 steps, or one step off the right hand end of the bank level. At the same time a cam spring set operated from a cam of the switch shaft, switches the ground for relay LR to a busy tone coil, which tells the subscriber that he has struck a busy group of switches and cannot complete his call, so that he should hang up and call again.

Release of Switch

When the conversation is finished, the calling subscriber hangs up his receiver, breaking the holding ground from the connector switch. The ground originally supplied to the release trunk from the release relay of the switch in Fig. 304 has been removed when the Sw. relay removed the ground from the line relay (LR). Therefore the only hold ground comes from the last switch of the train which would be the connector. The Sw.

(Continued on page 57)

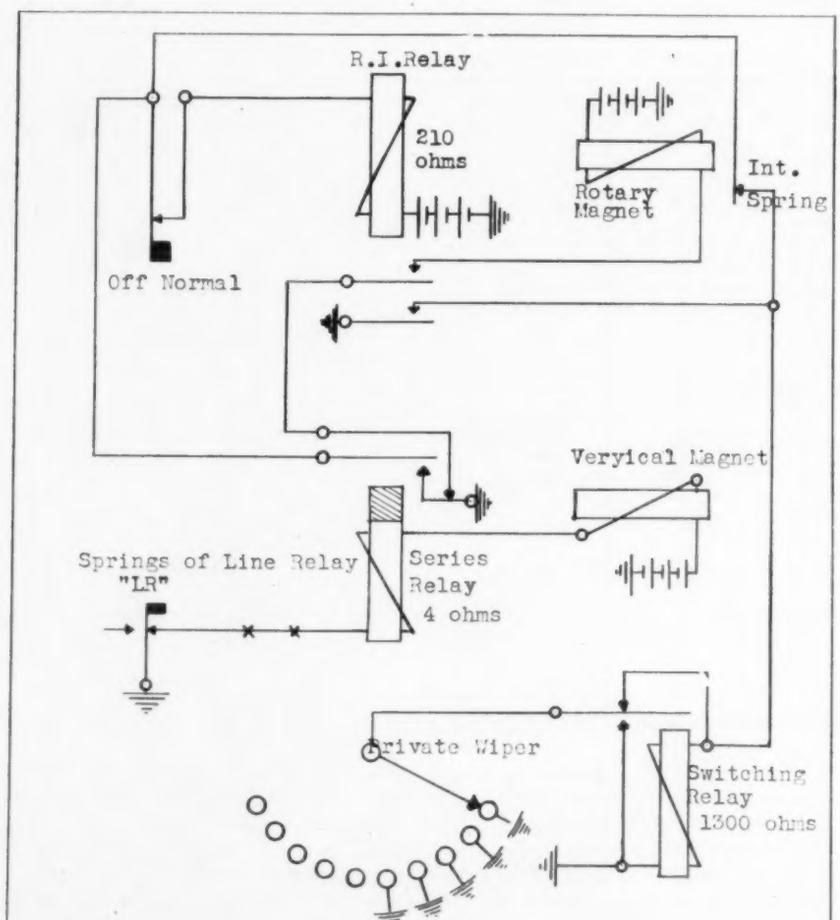


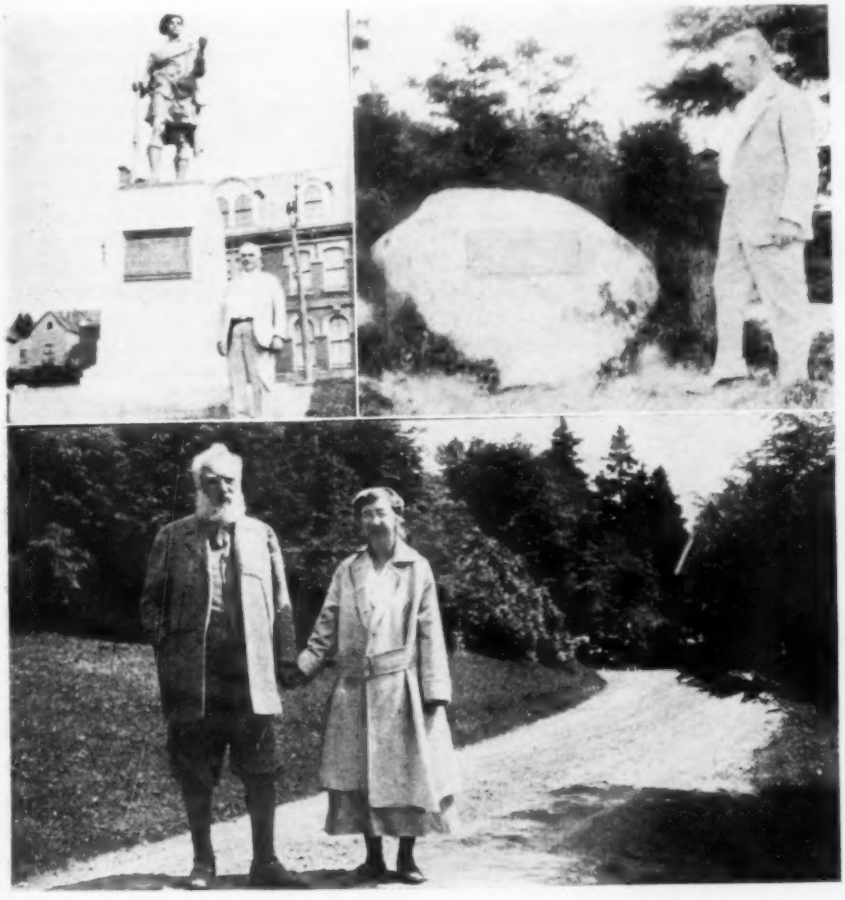
Fig.303

Visit to Shrine of a Telephone Pioneer

P. Kerr Higgins, President and General Manager of the Scotia Telephone Company, St. Louis, Mo., Writes of a Trip Made to the Tomb of His Old Friend, Professor Alexander Graham Bell.

My acquaintance with Prof. Alexander Graham Bell during his lifetime recently prompted me to visit his old summer home and resting place near the little village of Baddeck, Cape Breton, Nova Scotia, Canada.

We made the trip by automobile, traveling 5,700 miles, most of which was through Canada and the New England states. The scenery throughout the trip was marvelous, but the climax was reached when we stood at the tomb of the sturdy pioneer and looked out over the famous Bras D'Or Lakes, with their thousand mile shore line.



Upper left: Monument to the early Scots pioneers at Picton Landing of the Hector. Upper right: Handsome bronze tablet marks resting place of Dr. Bell. Mr. Higgins is shown viewing tablet. Below: The late Dr. and Mrs. Alexander Graham Bell, Beinn Bhreagh, Cape Breton, N. S.

In the foreground was the village of Baddeck, the trading place of the territory. It was with genuine pleasure that we took the paths and saw the places Dr. Bell must have been wont to spend his leisure time—if ever he had any. Little wonder that this famous Scot selected this part of Cape Briton! The whole surroundings must have reminded him of the scenery of Bonnie Scotland, his birthplace.

We crossed the ferry Dr. Bell had crossed many times; it has been left as it was then, even to the same notice board and telephone which he often used. Most of the natives with whom we talked remembered this telephone genius and talked freely about his wonderful personality and of incidents occurring during his life among them.

A plain but very handsome bronze tablet had been placed on the huge boulder marking Dr. Bell's resting place only two weeks prior to our visit. The tablet is divided in two parts and bears this simple but effective inscription:

Here Rest
Alexander Graham Bell
Inventor-Teacher
Born
Edinburgh
March 3, 1847
Died
A Citizen of the U. S. A.
August 2, 1922

—

Mabel Hubbard Bell
His Beloved Wife
Born
Cambridge, Mass.
Nov. 25, 1858
Died
Washington, D. C.
Jan. 4, 1923

As I stood looking at the tablet he seemed to talk to me as he had done in Boston in 1911. We had spoken of Scotland, and with an emphasis I shall never forget, he said, "Young man, in your birthplace you had a valuable heritage, but the greatest honor that can come to you is that of being a citizen of the United States of America."

"Beinn Bhreagh," the old home of Dr. Bell, is about five miles from Baddeck and would have been easily overlooked had we not made inquiries. Only a small board bearing the name on it indicates the entrance which is narrow and in some places a one-way road. However, a much better road leads from the residence via the lake shore to Baddeck, over which road we made the return trip. The most difficult part of the trip is from the residence to the tomb, although all along the road are resting places with rustic benches.

Returning, we stopped at the residence and found there the daughter of Dr. Bell with her husband, Gilbert Grosvenor, LLD., Litt. D., president of the National Geographic Society and editor-in-chief of the National Geographic Magazine. Their New England hospitality and kindness will always be a sunny spot in our memories of the beautiful Cape Breton.

The village of Baddeck has been associated with the three great inventors—Morse, Bell, and Marconi.

The first Atlantic cable was landed at Money Point, Cape North, in 1867, with a land line connection to North Sydney. This single metallic line ran through this lonely north country as a solitary link connecting two continents and uniting for the first time two civilizations.

Then came the twenty-five years of research and experimental work of the late Dr. Bell, with its world wide results covering aerial locomotion, the telephone, instruments for musical and vocal transmission, and sea planes. The first air flight in the British Empire was made at Baddeck.

Finally, it was the scene of Sig. Marconi's initial triumph, for at Sydney from the deck house of the Royal Italian ship, Carlo Alberto, he was first assured of successful wireless telegraph and the first trans-Atlantic message went from Glace Bay, N. S., to Clifton, Ireland.

How Flutter May Be Avoided In Loading Coils

F. J. Rasmussen, Telephone Apparatus Development Department, Bell Telephone Laboratories, Tells How to Select Loading Coil by Measuring the Relative Variations in Both Resistance and Inductance

In the design of new types of loading coils, accurate measurements must be made of the changes in their high-frequency resistance, and inductance when low-frequency currents are superposed, in order to make sure that the coils will give satisfactory service when installed in telephone circuits that are composited for simultaneous telegraph and telephone operation. The telephone transmission distortion that results from these changes in the loading coils caused by superposed telegraph currents is known as "flutter."

The effect of flutter on voice currents is shown graphically, but considerably exaggerated, in Fig. 1. At the left is a 25-cycle current representing the telegraph currents and a 1600-cycle frequency serving as a substitute for the voice currents. After these are passed through a loading coil, they would appear, when separated, as shown at the right. The wave form of the low-frequency output is similar to that of the impressed voltage. The received voice-frequency current, however, is found to follow a cycle of amplitude variation, at double the rate of the low-frequency current.

If pictures of these two out-put currents were taken on an oscillograph calibrated in terms of volts and amperes, the average impedance of the loading coil to voice currents could be computed for each moment of time. A curve of impedance so found would be similar to the bottom curve of Fig. 1. The impedance would rise and fall at twice the rate of the low-frequency current. Both inductance and resistance components vary but the flutter effect of the change in inductance is of much smaller magnitude.

By measuring the relative variations that take place in both resistance and inductance, it is possible to predict which of several types of loading coils would produce the least flutter effect when used for loading composited telephone circuits. Although it could not be assumed that the results of measurements made with two arbitrary frequencies, such as 25 and 1600 cycles, would give results identical to those obtained with actual telegraph and telephone currents, it has been found from tests that results so obtained can be used to estimate the actual flutter to a first approximation.

To compute the varying quantities from the oscillograph would obviously not be practicable. For accurate and easily made measurements some form of bridge seemed desirable. Two problems in the design of the bridge network, however, had to be solved. The changes in high-frequency resistance to be measured take place only when a superposed low-frequency current is passing through the loading coil. The first problem was to devise a bridge network which would

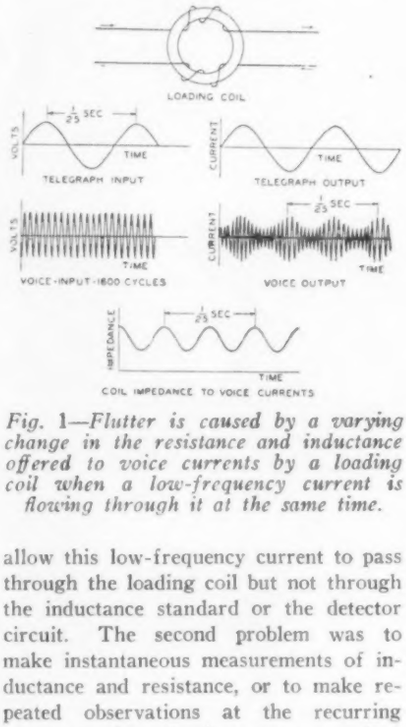


Fig. 1—Flutter is caused by a varying change in the resistance and inductance offered to voice currents by a loading coil when a low-frequency current is flowing through it at the same time.

allow this low-frequency current to pass through the loading coil but not through the inductance standard or the detector circuit. The second problem was to make instantaneous measurements of inductance and resistance, or to make repeated observations at the recurring moments when the instantaneous values of inductance and resistance repeat themselves.

The first problem was solved by connecting two similar loading coils into an auxiliary bridge as shown in Fig. 2. The loading coils are balanced by two air-core coils of much higher inductance. When a low frequency is connected to the points E and F and the bridge is balanced, current will flow equally into the two loading coils, but there will be no difference in potential across A and D and no current will flow into any circuit connected across these two points. This auxiliary bridge is used as the unknown arm of the flutter measuring bridge which appears as shown in Fig. 3. The high-frequency measuring current for the bridge is obtained from an oscillator. The portion of the current flowing through the arm AD divides between the two arms of the auxiliary bridge but the inductance of the air-core coils is made so much greater than that of the loading coils that nearly all of the current flows through the latter. The bridge is balanced for an instantaneous condition by an adjustment of the resistance and inductance in the arm CD. Due to the presence of the low-frequency current in the loading coils, the high-frequency impedance across A and D varies at double the rate of the low-frequency current and the detector must be designed therefore to measure instantaneous values of a varying resistance and inductance.

An ordinary mirror-type oscillograph was originally used as a detector. Its arrangement and relation to the bridge is shown diagramatically in Fig. 4. At the left are shown the 1600 and 25 cycle supplies, and at the right the output—from AC of Fig. 3—is shown connected to a high-gain amplifier which, in turn, connects to the oscillograph. The mirror of the oscillograph vibrates with an amplitude proportional to the output of the bridge. A beam of light is reflected from this vibrating mirror to a set of mirrors which are rotated by the motor driving the low frequency generator.

The rotating mirrors spread out the beam of light in a direction at right angles to its vibrating motion so that the actual wave form of the output current appears on the screen of the oscillograph. The number of mirrors used and their arrangement is selected with regard to the design of the generator so that successive sections of the output wave reflected by successive mirrors are superimposed at the rate of 25 per second. This speed is so great that the persistence of vision enables one to see on the oscillograph a stationary section of wave form representing the recurring sections of the amplified output current.

The oscillograph screen may be marked to show definite points of phase with respect to the low-frequency current. By adjusting the resistance and inductance standards, an instantaneous balance of the bridge can be obtained for

any definite point of phase on the low-frequency wave, such balances being indicated by a constriction of the standing wave to zero width, at a corresponding point on the longitudinal axis of the standing wave. By making a series of instantaneous bridge balances, the points of zero output can be made to shift from one end of the screen to the other. When suitably corrected, the bridge resistance and inductance settings for this complete cycle of measurements give the variation of the high-frequency resistance and inductance of the loading coils for a complete cycle of low-frequency current. The curves in the lower part of Fig. 1 are samples of data obtained in this way.

This bridge met the needs of the Laboratories for fourteen years. Recently it became necessary to build another flutter bridge, but before undertaking the work the older method was carefully studied with the object of making improvements. One of the important betterments was to substitute an improved bridge, arranged for "balanced to ground" measurements, which eliminated certain possible errors of the older type. Another improvement was to use coils of much higher inductance and wound in toroidal form for the air-core coils of the auxiliary bridge. This not only reduced the error due to the shunting action of the coils but eliminated

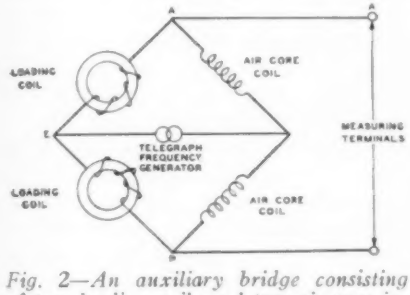


Fig. 2—An auxiliary bridge consisting of two loading coils and two air-core inductances is used to prevent the low-frequency current from flowing through the circuits of the measuring bridge

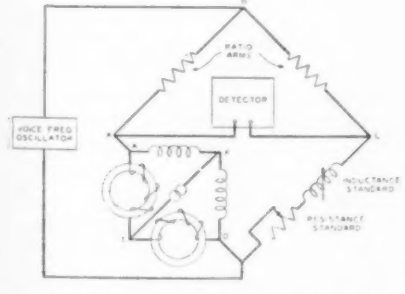


Fig. 3—Diagram of the measuring bridge showing the auxiliary bridge in one arm

their external field which, in the old form of bridge, made it necessary to place them at some distance from the rest of the apparatus. A third major improvement was the use of the cathode ray oscillograph in place of the vibrating mirror type.

The arrangement is shown in Figure 5 which except for the detector is like the preceding figure. Instead of using rotating mirrors to spread the amplified wave

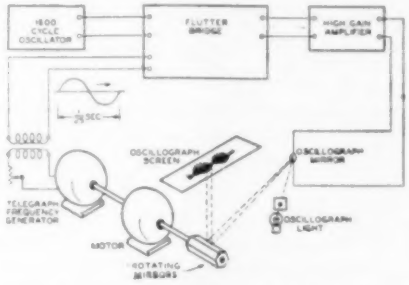


Fig. 4—Light from the mirror of an oscillograph is reflected to a screen by a mirror rotating at a speed corresponding to that of the low-frequency current

horizontally, it is drawn out into a circle on the front of the oscillograph. A small portion of the output of the low-frequency generator is passed through a transformer with a double secondary winding. Across the terminals of one of the windings is connected a resistance, and across the terminals of the other, a condenser. The current through the first winding is thus 90 degrees out of phase with that through the second, and the voltages across the two output circuits bear a similar phase relationship to each other. Connecting these secondary windings to the plates of the cathode ray oscillograph, which are 90 degrees apart in space, causes the stream of electrons to rotate and to appear as a circle on the front of the oscillograph. One complete

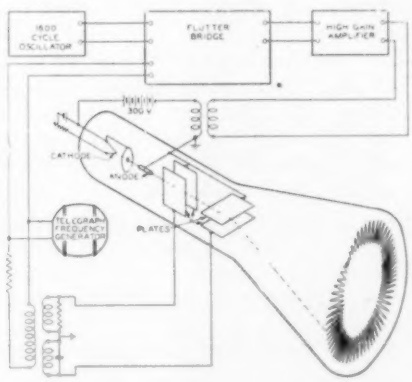


Fig. 5—Substituting the cathode ray for the vibrating mirror oscillograph avoids the necessity of rotating mirrors

revolution is made in 1/25 of a second, or for each low-frequency cycle.

Between the filament, which acts as the cathode of the oscillograph, and the anode is a 300-volt battery and in series with it, the secondary winding of a transformer connected to the output amplifier of the bridge. With no current flowing in the output circuit, the potential of the cathode remains constant at 300 volts below the anode, and a smooth circle would be formed on the front of the oscillograph. With an alternating output, however, the constant 300 volts is increased or diminished alternately by the amount of the amplified voltage of the bridge output, and the electron stream will have as a result a greater or less velocity, and be deflected less or more by the voltages impressed on the plates. Under these conditions the stream of electrons follows a vibrating path in its rotation, and at each point the amplitude of the vibrations corresponds to that of the output wave.

With this new arrangement, therefore, the output of the bridge, instead of being spread out straight, is curved into a circumference which is traversed once during each cycle of the low-frequency current. The front of the oscillograph screen may be marked with radial lines each indicating a definite point of phase on the low-frequency wave. A zero amplitude of vibration of the image on the oscillograph indicates that for that point of phase on the low-frequency wave the resistance and inductance of the loading coils is equal to the setting of the bridge.

This arrangement, therefore, makes it possible as with the original flutter bridge, to determine the variable high-frequency resistance and inductance of the loading coils as a function of time.

This new detector for the flutter bridge has been in service several years and have proved satisfactory in every respect. The elimination of rotating apparatus has simplified the equipment and with the other modifications has greatly increased both the speed and precision of measurement.

PURCHASES FIVE NEW OPERATING COMPANIES

The purchases of five new telephone operating companies in Wisconsin by the Associated Telephone Utilities was announced recently by Marshall E. Sampsell, president.

The purchased companies include the Farmers Inter-County Mutual Telephone Company at Kilbourn, Delton Telephone Company at Mirror Lake, Friendship Telephone Company at Adams, Adams County Metallic Telephone Company at Strong's Prairie, and Bingham Telephone Company at White Creek.

PHILIPPINES TELEPHONE COMPANY INCREASES STOCK

The Philippine Long Distance Telephone Company, Manila, recently filed an application for increasing the capital stock of the company from P1,000,000 ($500,000) to P10,000,000 ($5,000,000). An official of the company stated that the increase in the capital stock and the recent purchase of the Philippine Telephone and Telegraph Company and other telephone systems in the Southern Islands are in line with the company's policy to provide dependable and economical service to the Philippine Islands.

Illinois Telephone Men Convene at Peoria

Richard A. Lumpkin Succeeds Louis Pitcher as President of Illinois Telephone Association; Vote to Increase Board of Directors to Seventeen Members; Executives Urged to Increase Selling Efforts; Plans for Cooperation of Telephone Companies with State Highway Police Discussed.

Richard A. Lumpkin of Mattoon, Ill., was chosen president of the Illinois Telephone Association at the annual meeting held November 12 and 13 at the Pere Marquette Hotel, Peoria. Mr. Lumpkin succeeds Louis Pitcher of Dixon, general manager, Dixon Home Telephone Company. Although one of the youngest members of the board of directors, Mr. Lumpkin has years of telephone experience behind him, for he is one of the third generation of a family engaged in the Independent Telephone business. His grandfather, the late Dr. I. A. Lumpkin, was president of an Illinois association prior to and shortly after 1900.

In order that a greater presentation might be had upon the board of directors for the various interests operating in Illinois, the constitution was changed to provide for 17 directors instead of the 15 previously specified.

All the directors were reelected except W. H. Bassett of O'Fallon, who has retired from active telephone work, and J. F. O'Connell of Madison, Wis. They were succeeded by Daniel Coombs of St. Louis, Mo., and C. R. Brown of Madison, Wis. W. S. Green of Pekin and Dr. J. G. Schwarz of Jerseyville were the two additional directors elected.

The hold-over directors were T. C. Ainsworth, Bloomington; A. R. Bone, Chicago; George X. Cannon, Freeport; E. D. Glandon, Pittsfield; Dr. R. E. Gordon, El Paso; H. G. Lankford, Chicago; R. A. Lumpkin, Mattoon; R. M. Matteson, Joliet; G. L. Mays, Murphysboro; A. R. Patterson, Streator; Louis Pitcher, Dixon; R. G. Roadstrum, Galesburg, Earl Stice, Altamont.

At the meeting of the directors, at which Lumpkin was chosen president. Dr. Schwarz was elected vice-president, and A. J. Parsons of Springfield, secretary-treasurer.

Addressing some 250 persons who attended the convention, President Pitcher opened the two-day meeting with his annual address, in which he outlined features of the association's work. He urged the replacement of worn-out iron circuits with copper and copper content wires at the present low cost per mile. Toll service would thus be improved, he said, and in a spirit of fairness the commissions allowed originating companies on long distance business should be increased as rates are lowered.

Plans for the cooperation of telephone companies of the state with highway police were also discussed by President Pitcher. He outlined the plan as follows:

"The public will be informed through the press that when an individual wants a policeman he should go to the nearest telephone, call 'Central' and then tell her the police are wanted. She will then connect the party with the nearest district office. These offices do not now exist, but their need was suggested by our committee and acknowledged by the highway department.

"The desk sergeant will then get in touch with as many patrolmen as the exigencies of the occasion seem to demand. This he will do largely through the use of the telephone."

President Pitcher said the plan called more upon the intelligence and resourcefulness of the telephone operator than upon any one else in the telephone organization. He said he hoped the plan ultimately would result in roadside police telephones, and a state-wide telephone typewriter service reaching all district police headquarters.

The annual report of Secretary-Treasurer A. J. Parsons showed an increase of ten companies to the association's membership roll and a healthy cash balance in the treasury.

F. B. MacKinnon of Chicago, president of the United States Independent Telephone Association, addressed the meeting on "National Problems." He spoke of the Couzens bill, providing for a federal communications commission and said the move would not be dangerous providing Congress would realize that the telephone industry is a stable one and should be kept separate from the unstable radio industry.

Mr. MacKinnon also discussed the problem of toll revenues of companies not owning toll lines as well as those who do own toll lines, and indicated he believed the Bell System had gone too far in making changes and in announcing reductions in toll rates without consulting the Independents. Inasmuch as some 15,000 Independent exchanges in the country are affected by announcements regarding toll rates, the question of compensation for handling toll service is an important one, he said.

An appeal to telephone managers and executives to increase their selling efforts formed the substance of a stirring address made by J. Howard Mathews of Springfield, chief engineer of the Illinois Commerce Commission, speaking on "Making Telephone Service Indispensable."

Although telephone service is something of a monopoly, he said, it is no different than a competitive business in that it needs the good will and appreciation of its patrons, and that it profits from an aggressive effort to obtain and retain that good will and appreciation.

"Some Possibilities in Telephone Sales" was the title of an address by John W. Wolcott, Chicago, general sales engineer, state area, Illinois Bell Telephone Co. Mr. Wolcott's paper effectively supplemented Mr. Mathews' discussion. He told of the training of telephone sales people, and of the sales field which consists of present subscribers and new customers. The field of present subscribers needs as intensive cultivation as the field of prospects, he said. The speaker then took up the matter of sales in the residence field and outlined a series of direct mail pieces to be followed by a sales effort by telephone.

Methods of timber preservation used by the Western Union Telegraph Co. were explained by F. S. Shinn, Chicago, of the Curtin-Howe Corp., New York. As a result of their experiments zinc metal arsenite was evolved, which is now called ZMA, he said. This has been adopted by Western Union as its standard preservative for poles, crossarms, and construction lumber. The poles are light in weight and easy to handle, Mr. Shinn said.

Another address of interest to telephone men in attendance was that by T. De Witt Talmage, transmission engineer, Illinois Telephone Association, Springfield, on the subject, "Association Transmission Activities." He outlined the progress of his department year by year since its instigation in 1925, and gave details of the work during the past year, referring to the bulletin which the association distributed on the subject "The Maintenance of Distributing Frames."

He said a bulletin was now in process of preparation, dealing with the subject of defective joints and connections resulting from poorly soldered or unsoldered conditions.

Interesting high lights on "Telephone

(*Continued on page 30.*)

Subscriber Records for Small Exchanges

W. H. Bowdle Tells How Complete Records of Individual Subscriber Equipment and Trouble Calls Can Eliminate Controversies and Assist Small Exchanges to Give Superior Service in Less Time.

The accounting methods used by most small telephone companies often fail to take into consideration any system of recording plant activities, and more particularly, the keeping of a systematized trouble record.

The average small telephone company manager may feel that there is little need for such procedure. Nevertheless I believe that a fair trial of the simple system I am about to outline will prove profitable inasmuch as it will give the subscriber the sense that he is receiving individual and personal service. In addition, it will furnish the company with valuable data for use in determining more accurately its operating costs per station or per unit of office equipment.

The first step consists of the inauguration of an adequate trouble record. There should be a card for each subscriber station, and for each unit of equipment in service, as for example, each pair of cords on the switchboard and each toll circuit in operation. A card, 5x8 ins. is a convenient size for this use as it affords sufficient space for all necessary data in connection with the circuit, and on the average will provide blank spaces for several years' reports.

This card file should list all stations by number rather than the subscriber's name; or at least it should be a numerical file rather than an alphabetic file. In the accompanying illustration a typical card of this type is seen with data such as would appear in connection with a subscriber's line and associated equipment. This card will be found to contain more detailed data than is ordinarily necessary, but I am outlining a card that may be universally used by both small and large exchanges.

At the top in the left corner should appear the telephone number and to the right the class of service. Next below should appear the subscriber's name and address exactly as listed in the directory and billing records. Then the date of installation and the name of the installer should appear, the latter to be used in case any question should arise concerning workmanship or the attitude of the installer, which needless to say should always be courteous and accompanied by a willingness to give the subscriber exactly what he wants as long as no specifications for installation are violated.

In the allotted spaces all facilities and equipment items which would enable a repairman to render prompt service on trouble reports should be shown in detail. It will be found that there is considerable saving in a man's time and in car mileage, if the repairman knows exactly what sort of equipment he is to find when he goes out on a case of trouble, and calls in to the central office for information will be unnecessary.

The remaining space on the card is to be taken up by trouble reports as shown, with dates of report and clearance and the name of the repairman involved. The

Main 237X			2 pty Rec			
J C Aldrich			401 S. Smith St			
DATE OF INSTALLATION	2-7-25		INSTALLER	Ryan		
CABLE	CABLE	PAIR	PANEL	JACK		
CONDUCTORS	B	19	10	4		
INSTRUMENT	BELL BOX	STAND	TRANS	REC	COIL	CORDS
W E Co	534A	40AL	329	144	46	450
DATE AND TIME	REPORT	TEST	TROUBLE FOUND		DATE AND TIME	REPMAN
8-4-29 10:15AM	Bells jingling	cannot receive	open ringer coil		8-4-29 1:15PM	Smith
12-1-29 2 PM	cannot get central	line O.K. cent. sw. operation	lamp burnt out in switch		12-1-29 4:15PM	WHB

Here is a very simple "Trouble Card" for present and future use

advantages of keeping a careful record of trouble are obvious. Should a subscriber enter the office and complain to the bookkeeper or clerk about the quality of his service, the employe may there refer to the card file and show the subscriber the card with its complete records of his line from the date of installation. It seems to be human nature for many subscribers to magnify their complaints. A telephone that has been in trouble for a couple of hours will be reported as having been out of service all day, and a case that has been giving repeated trouble will be reported as having been absolutely out of service for the past month. Even the most irate subscriber often loses much of his ill temper when he is shown in black and white a history of his line as shown on the card, and the knowledge that each report is handled properly will cause him to realize that the company is eager to co-operate in giving him the best possible service. On the other hand, if the employe has to confess that there has been repeated trouble, yet has no records to back up his attitude of wishing to render service, the subscriber might be justified in feeling his interests neglected.

Some exchanges make a practice of entering all reports on the same line within a month of each other in red so that special attention may be given to the case, special inspection and routine made of all parts of the circuit to insure against further repetition of such complants. It may be found helpful to keep a list of repeated troubles for a basis of comparison in order to insure proper maintenance practices. If for example there is in any one month a large number of cases of trouble in subscribers' drops it can be readily seen that a special inspection and repair of all drops will materially lessen any further repetition of this type of trouble.

Some companies even go beyond this and set a time expectancy for clearing trouble. In the plant of the average small company it should be comparatively easy to clear a case of central office trouble within an hour of the time it is reported if there is a tester or central office maintenance man present at all times at the exchange building. If one man clears all the trouble both in and out of the exchange building a half day should suffice for a case that is cleared in the office. For a case of trouble within the town limits, for example a case on single or two party lines, a half day should be a sufficient limit for clearance, while a case of trouble on rural lines should be cleared within a day of its report. By a day, I refer to a twenty-four hour period as it would be obviously impossible to clear a case of this nature the same day, were it reported at four o'clock in the afternoon. When a case is not cleared within the time expectancy a check in blue or green pencil may be made on the line containing the report, thus enabling the company to answer correctly complaints that the subscriber's telephone has been out of service for any extended length of time over the expectancy. This practice is not without its merits as it involves nothing more than an intelligent handling of the card file and no extra expense.

(*Continued on page* 57)

Preserving the Switchboard No Problem

Ernest Wommack Analyzes Sources of Switchboard Trouble and Tells How Years of Service May Be Added to the Switchboard; Says All Difficulties Usually Arise in Keys and It Is Wise in Repair to Remove as Few Keys and Handle as Few Wires as Possible.

It has been stated many times that, barring obsolescence, the life of a switchboard is limited to the usefulness of the wiring. Experience has proven that the switchboard wiring is rarely ever disturbed except at the keyboard and this is due to different faulty conditions arising in keys, which necessitates their removal for repair.

It is obvious then that the best method of preserving switchboards is to remove as few keys and handle as few wires as possible. The purpose of this article is to pass some of our experiences to readers of TELEPHONE ENGINEER who deal with similar conditions, and we also hope that it will be of interest to the manager and owner who is anxious for his switchboard or switchboards to give the best and longest service possible.

Being somewhat familiar with Kellogg four-party harmonic ringing equipment, reference will be made to the No. 190 four-party key and associated equipment.

The most common sources of trouble in the four-party key are: (1) Natural wear through usage which finally makes necessary the removal of the key for repair or replacement; (2) unnecessary impairment due to "breakdown" of insulation in the key.

In the first instance it has been found that the life of the key is long, but there are certain parts which eventually become so worn that operation of the key becomes unsatisfactory. This is particularly true with regard to the sliding bar in the key, No. 190, which is located directly above the frequency spring assemblies. The end spring assembly on the above key is actuated by the sliding bar which is in turn actuated by plungers, a plunger being assigned to each frequency.

Under (2) of the above classification it has been found that constant pushing down of the plunger against the sliding bar causes wear to both and results in a deposit of metal filings on the insulation between the frequency springs. This deposit forms a conducting path for the ringing current which is seeking ground, an arc is produced, burning a permanent path between the springs, and the only remedy is to remove the key in trouble.

So much for cause and effect. From a prevention angle a very simple method has been employed to reduce insulation breakdown. The accumulation of filings are blown out of the key before arcing begins. This is done by improvising a small tool adopted to the purpose. It consists of a piece of copper tubing as used in electric refrigerators with a short turn at one end and a small hole in the same end (the small hole can be made by using a hammer until the desired opening is formed). The attachment on the other end depends on the source of air supply and will have to be worked out by the individual.

We use a motor-driven compressor, but an automobile pump will give good results. For a pump attachment it is suggested that a tire tube valve be used with core removed and in this way the tool may be removed from the pump when it is not being used as a blower.

Compressed air, it is said, contains moisture and for that reason, among others, its use is not advocated around switchboard and relay rack cables. In this instance, however, it is of no consequence because the air is not being used on wiring but merely on the switchboard keys. In any event the remedy is much less harmful than having to remove keys at frequent intervals for repair.

In the later type of four-party key the sliding bar is located on one side of the key, allowing any metal particles to fall into the bottom of the key shelf and not into spring assemblies. The cost of replacement with new type keys is comparatively costly and when properly maintained the No. 190 key gives very satisfactory service.

One method of quickly detecting the broken down condition in the frequency spring assembly of a key is as follows: The end spring assembly of the No. 190 key, which consists of two make and two break contacts, has ground on one of the two top contacts at all times. If a key has broken down or is breaking down the other top contact will have ringing current on it. In such case a shock is felt when we touch both of the top springs at the same time. The keys in a switchboard may be quickly checked in this manner and steps taken for the removal and repair of bad keys.

It is necessary to remove keys from time to time for replacement of worn parts. Such a condition cannot be avoided but we can avoid the necessity of removal due to breakdown by practicing the sound policy of keeping keys clean.

It has been found helpful to keep a record on repaired keys by use of a chart showing position and key, with space for date of repair and any vital notes. For example, key No. 1 of switchboard position 4 is repaired and after being placed back in service, date of replacement and parts replaced are recorded. In case the key develops trouble too soon after it has been placed back in service we know that we have not been as careful in our work as we should have been.

Since adopting the policy of "blowing out" metal deposits in keys, we have found that breakdown has been appreciably reduced. A study made over a period of two months reveals that not a single case of trouble of this type has developed in a switchboard under our observation.

The subject of pole changers has been ably covered by others in the past but there is one point of sufficient importance to be emphasized here. Regardless of how carefully pole changers of the harmonic type are adjusted, unless the machines are mounted on a solid wall they cannot be made to function properly. This is due to the fact that when there is an opportunity for excessive vibration a counter vibration is set up between the different vibrating reeds which results in what is generally called loping.

We have known plant men who pronounced harmonic pole changers impractical simply because they were not aware that to be successful the machines had to be solidly mounted. Subscribers quite often have a dislike for party lines and in order to keep them satisfied it is necessary to keep ringing equipment in good order. Where this type of service is being found helpful to overcome shortage of cable pairs in congested areas we must be careful to avoid "ringing over" conditions if we expect to hold the valuable good-will of subscribers.

It might be added here that some types of ringing machines were designed originally to operate from a battery separate from the main battery which supplies current for the common battery plant. However, from a standpoint of economy and simplicity it is sometimes desirable to also use the main storage battery for the ringing machines. One disadvantage was that during the charging period an excess amount of current was placed on

(*Continued on page 32.*)

Treatment of Wood for Telephone Poles

Wood Preservation Is Discussed by C. M. Tilley, Superintendent, Texas Creosoting Co., in This Address Given Before the District Meeting of the Texas Independent Telephone Association; He Explains Causes of Damage to Poles from Fungi and Methods of Stopping Their Growth.

Wood preservation is not a new industry. It dates back to about 1657, when a German named Johann Glauber experimented with the treatment of wood with

One of the many reasons why telephone men should use treated poles

vegetable pyroligneous acid to protect it against decay. This is the first attempt at preservation of which we have any definite knowledge.

Since then almost everything under the sun has been tried to preserve wood, even a mixture of a decoction of tobacco leaves and tar. However, the science of wood preservation, as we know it today, is comparatively new and has been brought to its present state of perfection within the last generation.

In 1875, the Louisville & Nashville Railroad built a plant at Pascagoula, Miss., for the treatment of piling and bridge timbers. This was one of the first plants to be built in this country for the pressure treatment of timbers with creosote oil, and it was one of the forerunners of modern wood preservation.

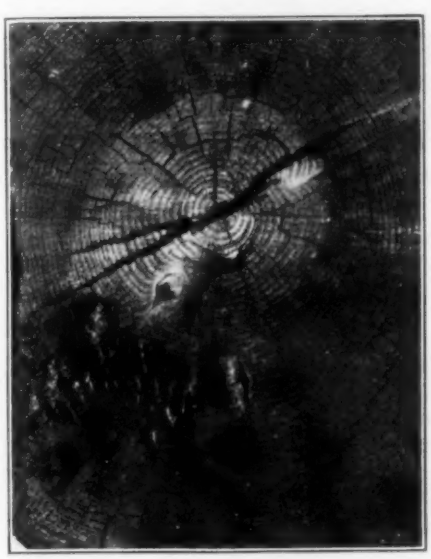
The first step toward a comprehensive knowledge of what is necessary for preserving wood is to know what causes the damage to the pole. There are, roughly speaking, two main causes of pole failures. The first and most common is what we know as **rot.**

A good deal of study has been put on rot and its causes, and it has been found that rot is a disease in wood caused by germs, which are known in their fruiting stage as fungi. These germs are carried from place to place by the wind and other agencies, making rot as contagious as germ disease in the human organism.

These fungi are divided into two classes: Harmful, which live on the lignins and cellulose, in the wood; and non-harmful, which live on the sugar and starches and do not damage the wood structure but indicate an ideal condition for the growth of the harmful varieties.

The modern wood preserver recognizes the danger of contagion. Well-regulated plants are careful to keep down infection as much as possible by keeping their yards clear of rotting wood, and the weed growth to a minimum around the stock piles. It is essential that the timber to be treated shall be free from mycella, which are the first stages or roots of the fungi.

The second class of wood-destroying organisms is the insects, by far the most interesting and fatal of which are the termites. These white ants, as they are sometimes called, are becoming more and more a menace, not only to pole lines but



Fungus growth on untreated wood

to any other structure which is built of untreated wood.

Termites at one stage of their development grow wings and swarm similar to the swarming of a colony of bees. They are becoming more widespread each year, and the only permanent protection against

Termite damage on untreated pole

them known at the present time is a thorough treatment with creosote oil or some other standard preservative.

Having studied the cause of pole failures and finding that they are caused by living organisms, both vegetable and animal, the next logical step is to find some substance or method by which the growth of these organisms can be stopped. The most obvious one would be to poison the food supply of these organisms. As they attack the wood primarily for food, the natural solution would be to poison the wood by injecting a toxic directly into it, thereby stopping the growth of all wood-destroying organisms and protecting the timber against failure indefinitely.

This, however, is not so easy and simple as it would at first seem. To be toxic or poisonous to fungi and other wood-destroyers, the substance has to be soluble to some extent in water. If, on the other hand, it is too soluble, it will leach out and we would not have enough toxicity remaining to poison the fungi and termites. Neither can this preservative be too volatile, for structural timber or poles

are used where comparatively high temperatures prevail, and a good part of the preservative may volatilize and not leave enough of the toxic material to protect the wood against decay.

These and many other considerations had to be mastered before a satisfactory preservative of known worth was available. As previously stated, nearly everything under the sun, which had hopes of preserving wood, has been tried since the inception of wood preservative. By the process of elimination we finally have left two standard preservatives of recognized worth. These more nearly meet the requirements that a preservative must necessarily have than any other. These are creosote oil and zinc chloride.

Modern creosoting plant and yard showing stocks of poles for seasoning

In creosote oil, we have a preservative of known worth, one which, properly applied, will give an average life to pole lines of from 30 to 40 years. However, there have been some failures which are traceable to the improper injection of the creosote. Unless the oil is properly distributed in the wood, it is almost axiomatic that failure of the pole will occur long before the anticipated life has been reached.

It can be readily seen that treating timber is not simply injecting a preservative into the wood. It starts with the cutting of the timber in the woods and its careful preparation, and only ends when the pole has given a satisfactory life to the company that bought it.

It does not necessarily follow that low-priced poles are always cheap. Unless the manufacturer has something to offer other than a low price, it is well to satisfy yourself regarding the fitness of his products to meet your needs. This is not always easily done, but a pole which has to have a life of from 30 to 40 years to justify its cost, is a rather expensive proposition if it fails in from 10 to 20 years. While you are waiting to find out if it will stand up, you have probably multiplied it by several thousand, and find yourself with miles of lines, which are expensive to maintain or rebuild.

Pole stocks showing method of stocking with creosoted dividing strips to prevent premature decay

I have heard much discussion of the rural lines at the last several meetings which I have attended, and I believe that the rural line question is a live issue. It seems to be the consensus of opinion that the telephone company should construct, own and maintain these lines, but that they should be built as cheaply as is possible and yet give good service.

This, I believe, is correct, but it does not mean that untreated material for your pole lines and crossarms is necessarily cheap. It is obvious that you can afford to pay three times as much for a pole or crossarm which will last you 35 years than for one which will only last you ten years, for you are at least ahead of the game to the tune of the replacements and resettings necessary with the pole with the lowest first cost.

We have another factor which has been injected into the problems within the last few years, and that is the termite. Some years ago, I went into east Texas to see a telephone manager there. He complained that he had bought a car of untreated poles which he had to reset in less than three years and that he would have to replace them in a year or less. On examination, these poles showed that they had been literally eaten up by the termites and had given him a life of about four or five years; poles which ordinarily should have lasted 15 years.

You are going to find the termites more and more as time goes on, for the experts tell us that they are steadily spreading and getting worse all over the country, and the only remedy seems to be the use of well-treated timber in your pole lines.

Now to the nub of the whole proposition. You are selling service with a capital "S," and service interruptions are something that the telephone man sits up nights to avoid or correct. With the properly treated pole, interruptions from pole failures are cut down almost to the vanishing point, and you can sleep nights instead of going around looking as glum as a delicatessen owner at a cooking school for young brides.

ILLINOIS TELEPHONE MEN CONVENE AT PEORIA

(*Continued from page 26.*)

Problems Outside of the United States" were given by W. H. Walter, president Monarch Trading Co., Chicago. He discussed the legal situation relative to operating telephone properties and stated that the basic telephone laws of certain countries can hardly be recognized as having to do with the telephone industry.

Frank T. Sheets, Springfield, chief highway engineer for the state of Illinois further outlined some of the mutual problems of the company and the highway department, previously discussed by President Pitcher.

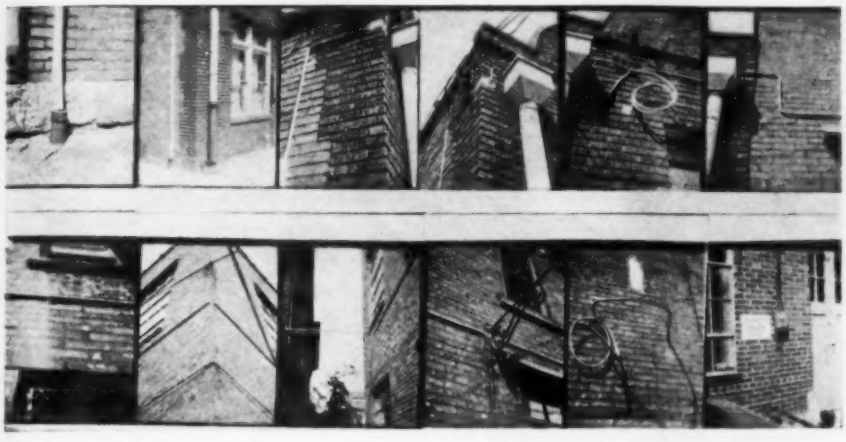
Paul J. Ramsey, general manager, state area of the Illinois Bell Telephone Co., Chicago, stated in his address that the period of rivalry between men engaged in the telephone industry has passed into an era of cooperation and coordination which will greatly aid progress in the telephone industry.

The two-day meeting closed with a banquet the second evening. The convention attendance prize was awarded to the Illinois Commercial Telephone Co., of Murphysboro, for having the largest number of employes present.

LINE AND DESK

TELEPHONE LOOKIEGRAPH

By Ray Blain



The camera shows the efficiency of this house cable installation

It seems that many telephone companies are neglecting that economical, convenient and altogether satisfactory method of cable construction generally referred to as house or block cable. With modern permanent buildings it is generally an easy matter to use this method in the average business section of any town or city. By following the camera eye through the "Lookiegraph" with me I will attempt to prove to you that a new job just completed was a good one.

First the feed for this block cable leaves the main in a convenient manhole, through a short section of conduit, a cast iron elbow and up under a split pipe type rise just around the corner from a building drain pipe. Then a straight vertical run, a right angle bend and around a corner by removing a part of a brick and then plastering the hole shut over the cable. Coming to a point where a splice is necessary, enough cable is left to meet the needs of the splicer. Next we pass over onto another building and must drop down about two feet to get a straight line that will clear most all obstructions. This drop to a new level wac accomplished by the two right angle turns with easy bends easy formed. Now for a time we have easy sailing with clamps neatly placed and evenly spaced. Now we go around another corner with ease, in the same manner as previously described, but find that to reach the next building we must cross a six-foot alley. This we accomplish by placing a steel rod and hanging the cable with ordinary rings or wire ties, as on a regular messenger. The former practice was to use a short piece of messenger, thimbles and guy clamps on such jobs, but considerable work was necessary to get it in place and it was never as neat or cheap as the convenient steel rod we used. Next we come to a lamp bracket which cannot be removed so we cut some bricks and go under it, then plaster up the hole. Now it is necessary to take a lateral into a building to an inside terminal, so we drill a hole, bring out the can tail and coil up sufficient cable for the needs of the splicer. When we come to an outside terminal we dropped down so that it would be placed within easy reach of the troubleman while standing on the ground. This makes testing and trouble shooting easy and eliminates the necesity of ladders. Yes, we are proud of our block cable job, and should you construct one **similarly.**

SERVICE DROPS

We publish below the answer to last month's specification problem. If you do not remember what it was, look up your November issue of TELEPHONE ENGINEER and you will find it on page 30. Here is the answer:

Service drops distributed from brackets attached directly to the pole must have a clearance on service pole only of 5 feet under supply circuits of 0-750 volts.

A 30-inch square climbing space must be maintained. Where necessary to obtain greater clearance over a crossing, the above clearing of 5 feet may be reduced to 2 feet, providing service wires are supported at least 25 inches horizontally from the center line of the pole.

A SIMPLE GROUND TEST

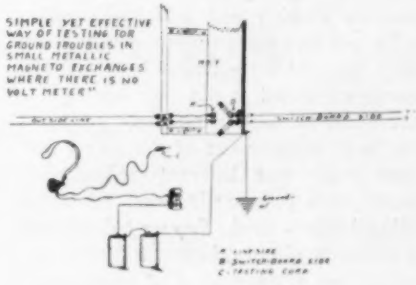
Oftentimes trouble that is thought to be in the switchboard proves to be elsewhere. I was in an exchange one time when the manager told me he had several metallic lines cross-talking, and that each one of them left the building through separate cables. Naturally he thought the trouble was in the board. With the aid of a receiver, two dry cells and about ten minutes' time the trouble was located and cleared. The trouble being his lines were grounded on the centrale office protector.

This simple test will prevent a lot of trouble reports if used regularly each morning.

Directions:

1—Place operator's receiver on head.

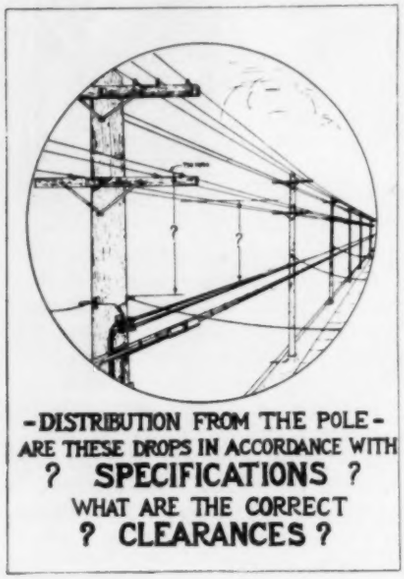
2—Take C, and start at number one, touching all A-terminals throughout the whole protector strip. If you get no click at all, it means, of course, there is no ground on that line. If a slight click is heard, it means there is a slight ground on the line being tested. If a lond click is heard it means a solid or dead ground.


SIMPLE YET EFFECTIVE WAY OF TESTING FOR GROUND TROUBLES IN SMALL METALLIC MAGNETO EXCHANGES WHERE THERE IS NO VOLT METER"

3—After getting a click, whether slight or loud, stop, and open the line by disconnecting one side of each fuse. Then touch C to terminals on line side or A. If you still get a click it shows that it is grounded on line side. If you do not get a click you will know it is on the switchboard end and nine chances out of ten it will be carbon trouble. Either lightning shot your carbons, dust or a conductor of some kind is across or between the carbons or the mica between them has fallen out or is too thin, all of which would cause serious trouble.

If you have run across any special or unique cases of trouble or tests that will prove of value to operating men, send them in and we will be glad to publish them.

DO YOU KNOW YOUR SPECIFICATIONS?



If you were correct on last month's problem, how about the one shown above? The answer will be printed in the January issue. Jot down your answer now and then check up next month.

IMPROVED SCREWDRIVERS

Perhaps the most used, and at the same time most bothersome, tool in the telephone man's kit is the screwdriver. Just recently there has come on the market a non-skid type screwdriver that is a great improvement over the old type. This new tool has a ribbed blade which prevents slipping and permits all effort to be put into the turning of the screw. With the old style about half of the energy expended is put into turning the screw and the rest in pushing to prevent the blade slipping out of the screw slot. Even rusty and battered screws are turned with comparative ease when the ribbed blade is used. Screws being placed in different places where the blade must reach them at an angle will be set much easier with this new style screwdriver. Any telephone man can readily appreciate this advantage.

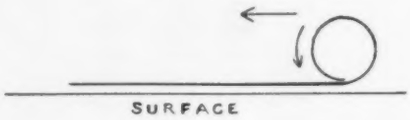
Placing screws overhead as on a ceiling is always a difficult task with an ordinary screwdriver but with this new style it is not necessary to expend as much pressure upward and the screws are run in with ease.

Slipping of screwdrivers has caused many a serious accident and injuries which have cost telephone companies thousands of dollars. As a safety first measure alone even if the rest of its advantages are not recognized this screwdriver should be adopted by telephone companies.

The non-skid blade will last much longer than the ordinary smooth kind due to the elimination of the slip.

Everything considered this new tool is so far ahead of the old style that it seems reasonable to expect its early adoption by all progressive telephone companies who are interested in good work and safety to their employes. Also it will help maintain good relations with their subscribers for the slip of a screwdriver has made many an enemy for the telephone company.

EASY WAY TO ROLL GUY MESSENGER



I have noticed a lot of men have trouble rolling up a length of guy messenger. It seems to me that the easiest way is to start a roll, then put it on the ground and roll so that the roll takes up the messenger, and moves along in the same direction that the messenger lies, as shown by the above sketch.—Eugene Davis.

PRESERVING THE SWITCHBOARD NO PROBLEM

(*Continued from page 28.*)

the pole changers, especially when the battery was charged at the full eight-hour rate. Such remedies as counter e.m.f. cells and cutting out one or more cells during the charging period were offered but this again involved departure from simplicity.

During the past few years much attention has been given to telephone storage batteries and many radical departures have been made from previous maintenance principles. One is that instead of charging a certain battery at, say, 20 amperes for eight hours as advocated by the manufacturer it may be better to lower the amperage considerably and charge over a longer period of time. If this latter method is used the battery will be longer lived and it will be noticed that the pole changer reed will not "pound" as it did on a full 20 ampere rate of charge. This method will tend to equalize the current supply to the ringing machines.

The subject of soldering irons comes to mind as a parting suggestion in this attempt to set down a few ideas regarding switchboard and ringing machine maintenance. Soldering irons to be used for switchboard work should be carefully selected. A small 50-watt iron has the advantage of light weight, less heat development, and for use in close quarters and for switchboard work it is far superior to the average size iron which oftentimes proves bunglesome and which if not very carefully handled will burn switchboard wire insulation. Any company not owning such an iron will find the purchase of one a sound investment.

AINSWORTH IS DIRECTOR OF NEW TELEPHONE FIRM

T. C. Ainsworth, manager of the Kinloch-Bloomington Telephone Company, is named as one of six incorporators of a new telephone company which was granted a charter Saturday by the secretary of state at Springfield, according to the Bloomington Pantagraph.

The Wabash Telephone Company, a three million dollar corporation, is empowered by the charter to construct and operate telephone lines in McLean, Edgar and Clark counties. Its offices will be in Bloomington.

The other incorporators are J. G. Crane, Ranford Dunlap, V. E. Chaney and H. M. Cox, all of Kansas City, and A. L. Staderman, Terre Haute, Ind.

The company expects an annual income of $381,000 in Bloomington and Normal and $99,000 in Paris, Ill., the press service reports.

ASSOC. TELEPHONE SHOWS HUGE GAIN

Consolidated gross earnings of Associated Telephone Utilities Company for the nine months ending Sept. 30, 1930, total $11,778,940, compared with $6,043,119 for the similar period of 1929. Net earnings after operating expenses and taxes are $5,358,548, compared with $3,019,867 for 1929. Net income, after interest and preferred dividends, but before depreciation, is $2,133,358, compared with $1,114,849, an increase of nearly 100 per cent.

Consolidated earnings statement for the nine months ending Sept. 30:

	1930.	1929.
Gross earnings	$11,778,940.18	$6,043,119.84
Operating expenses and taxes	6,420,391.24	3,023,252.11
Net earnings	5,358,548.94	3,019,867.73
Interest and other deductions	2,786,280.77	1,691,582.14
Net income	2,572,268.17	1,328,285.59
Dividends on preferred stock	438,909.55	213,435.90
Net before depreciation	2,133,358.62	1,114,849.69

BELL TELEPHONE COMPANY TAKES OVER 2 EXCHANGES

Oklahoma City.—Consolidations of telephone exchanges at Haileyville and Arapaho with the exchanges of the Southwestern Bell Telephone Company have been completed and the latter company is now operating these properties. The Haileyville exchange was purchased from A. J. Nelson and the Arapaho exchange and rural line systems at Clinton and Arapaho were purchased by the Bell company from James McLin.

Their words have wings as swift as light

An Advertisement of the American Telephone and Telegraph Company

We live and work as no other people have ever done. Our activities are pitched to the swiftness of the instantaneous age.

Whatever happens, wherever it happens and however it may affect you, you may know it immediately over the wires or the channels of the air that carry men's words with the speed of light. Business and social life are free from the restrictions of time and distance—for practically any one, anywhere, may at any time speak with any one, anywhere else.

The widespread and co-ordinated interests of the nation depend upon an intercourse that less than sixty years ago was not possible in a single community. This is the task of the telephone wires and cables of the Bell Telephone System—to make a single community of our vast, busy continent wherein a man in Los Angeles may talk with another in Baltimore or a friend in Europe as readily as with his neighbor.

It is the work of the Bell Telephone System to enable friends, families and business associates to speak clearly and immediately with one another, wherever they may be. Its service is as helpful and accessible on a village street as in the largest cities.

To match the growing sweep and complexity of life in this country, to prepare the way for new accomplishments, the Bell System is constantly adding to its equipment and bettering its service.

To this end, its construction program for 1930 has been the largest in its history. This System at all times accepts its responsibility to forward the development and well-being of the nation.

Telephone Activities Abroad

Dispatches from Foreign Countries Keep United States Telephone Men Informed Concerning Telephony of the World

Telephone Service to Hawaii

Sites for radio stations for telephone service across the Pacific Ocean have been purchased by the Transpacific Communication Company, Ltd., a subsidiary of the American Telephone & Telegraph Company. Erection of the stations will begin early next year and service between the United States and Hawaii is scheduled for January, 1932. This is the first step in the move of the Bell System to connect its American network with Far Eastern countries. The project contemplates eventual establishment of services to Japan, Australia, the Philippines and Alaska, as well as ships at sea.

The transmitting station will be located at Dixon, Calif., near Sacramento. The 20 k.w. transmitted to be installed there, which will be similar to those used in the transatlantic telephone service, will operate on wave lengths between 14 and 44 meters. The antennas will have marked directional characteristics; other transmitters will be installed as new channels are opened. The receiving station will be located at Point Reyes, Calif., on the coast northwest of San Francisco. Its antennas will also have directional characteristics.

The radio channels set up by these stations initially will connect with the telephone system of the Mutual Telephone Company of Hawaii.

One Long Distance Line in Turkey

Until the opening of the Istanbul-Ankara telephone service on July 1, 1929, communication between the capital and Istanbul was carried on by telegraph. Ever since the long-distance line was put in operation it has enjoyed increasing popularity; 67,393 paid conversations were held during 1929. At the present time an average of 280 paid conversations are being held daily, indicating an even greater use.

As an encouragement to further business the Bureau of Posts, Telegraphs and Telephones, which operates this service, recently reduced the toll from 115 piasters to 100 piasters (about $0.47) for the usual three minutes. This line is still the only long-distance telephone service in Turkey.

Telephone Construction in Yugoslavia

The Ministry of Public Works in Yugoslavia has called for bids on extending and improving the telephone system in that country.

It is proposed to build interurban and international telephone cables on the main telephone arteries, and to install equipment necessary for their operation.

Financial conditions attached to this project are, that the contractor accord the government of Yugoslavia credit to the total cost of the materials and the job, the debt to be amortized either in cash on completion of the work, should this be feasible, or through a seven per cent loan service, covering a period of thirty years, carried in the annual budget. The original time limit for the acceptance of bids for this work was set for December 10, 1930.

No Communication in Liberia

The attention of the world has recently been centered on Liberia, as the result of a statement made by Vice Consul C. H. Hall, Monrovia, Liberia, who publicly brought to light the fact that Liberia has no interior lines of communication, such as telegraph or telephones. Messages are sent from town to town by runner or surf-boat.

Telephone Service Between Europe and Australia

Since the telephone service between Australia and Europe was inaugurated in April the revenue received in Australia has been £6,744, according to The Electrical Review, London, which quotes from the Sydney Morning Herald, Sydney, Australia.

More use has been made of the service in England than in Australia, the number of calls originating in the two countries having been 440 and 229, says the Review.

Telephones Increase in New Zealand

An official table recently submitted by Trade Commissioner Julian B. Foster of Wellington, New Zealand, shows that telephones have increased 36.6 per cent since 1925. The total number of telephones in the Dominion of New Zealand in 1925 were 112,858, as contrasted to 154,238 today.

These telephones are connected with the Auckland, Wellington, Christchurch and Dunedin exchanges. The largest number of telephones connected with any one exchange are at Auckland which has 20,413 against 12,581 in 1925 and 1,100 in 1900.

Wellington now has 19,505, contrasted with 13,547 in 1925 and 1,373 in 1900. Christchurch, which had 953 in 1900, 9,425 in 1925, has 12,311 telephones today, and Dunedin, which had 1,054 in 1900, 6,571 in 1925, has 8,367 today.

Ships to Have Telephone Service in Port

An experimental telephone plant whereby any vessel on her arrival at Cardiff Docks, Wales, can be connected with the Post Office system by means of a plug-in cable passed on board, is to be installed, according to the Electrical Review, London.

Persian Telephone Company Receives Government Aid

The Telephone Company of Persia, upon the plea of its director, Arbab Keikhosrow Shahrokh, has secured governmental assistance in liquidating its indebtedness of some $75,000 for new material recently purchased in Europe. This company is said to be the only private Persian company in Persia still active after a period of 29 years.

Radio-Telephone Service Between France and Morocco

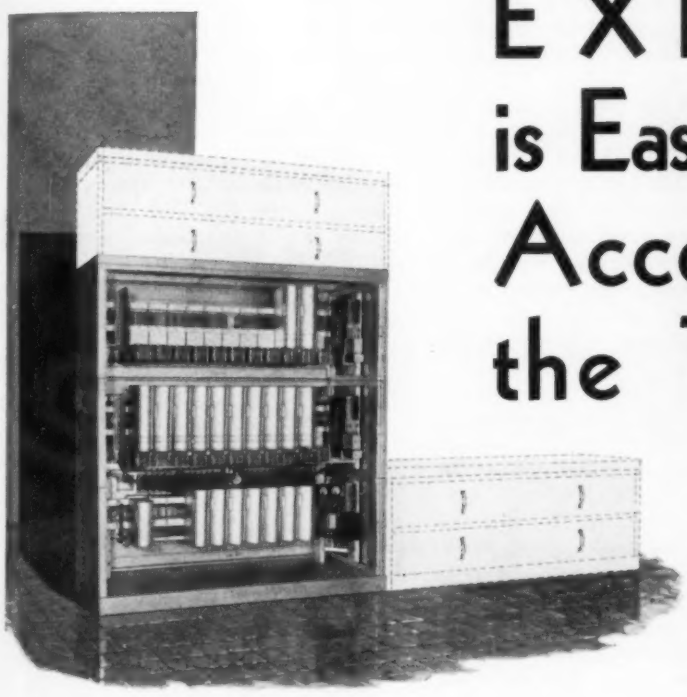
It is believed that the Morocco-France radio telephone service will function from now on under satisfactory conditions, according to Trade Commissioner Thomas Butts of Paris, France. This line was first available for public calls on October 22. As the inauguration coincided with the visit of the President of the French Republic to Morocco, the service was very busy on that day, and apparently has operated satisfactorily since then.

Telephone in Hungary Is State Monopoly

The telephone in Hungary is a state monopoly under the direction of the Royal Hungarian Post Office Direction, which is a special division of the Ministry of Commerce. As a government-owned enterprise, the Post, under Hungarian laws, is compelled to purchase material of domestic make only, unless unobtainable from local manufacturers. Telephone mileage is 360,606 and there are 1,276 exchanges. The number of subscribers to the monopoly is 75,713. Local calls made within the city of Budapest totaled 94,214,700.

Santos Telephone Contract Signed

The telephone contract between the Municipality of Santos and the Brazilian Telephone Company (British) has been definitely signed. The company was granted a term of thirty months in which to complete the installation of automatic telephones in Santos. There are about 3,600 lines with a total of 4,700 telephones in operation, and according to the estimates of the company, the number of telephones will be increased to about 8,000 as soon as the new service is installed.



EXPANSION is Easily and Quickly Accomplished with the TYPE 51 . . .

THE newly developed Type 51 Strowger Dial exchanges for small communities offer the highest type of swift, accurate service to such localities. Standard Strowger switches are used throughout, and no matter whether there are only a few telephones, or several hundred, to be served, there are no difficulties which these new units do not meet with the highest satisfaction.

The sectional type framework which they use, makes them readily adaptable to practically any space which may be available. The shelves of equipment resemble the shelves of a sectional bookcase and expansion is accomplished simply by adding sections. If the ceiling height is limited, new sections necessitated by growth can be added horizontally—and placed to conform most conveniently to any desired floor plan layout.

Designed for operation on an entirely unattended basis, these units make profitable operation of small exchanges possible by eliminating all local operators. Information, toll and such special services are easily handled over trunks by existing positions at the nearest toll center. Write for Bulletin 1551, which describes this modern small exchange equipment in more detail.

Automatic Electric Inc.

Manufacturers of

STROWGER AUTOMATIC DIAL TELEPHONE AND SIGNALING SYSTEMS

Factory and General Offices: 1033 West Van Buren Street, Chicago, U. S. A.

Sales and Service Offices in All Principal Cities

STROWGER AUTOMATIC DIAL SYSTEMS

GENERAL EXPORT DISTRIBUTORS

The Automatic Electric Company, Ltd., Chicago

In Canada . . . Independent Sales and Engineering Co., Ltd., Vancouver

In Australasia . . . Automatic Telephones, Ltd., Sydney

In Japan . . . Automatic Telephones Ltd. of Japan, Tokyo

ASSOCIATED COMPANIES

American Electric Company, Inc. . . . . Chicago

International Automatic Telephone Co., Ltd., London

Automatic Telephone Manufacturing Co., Ltd., Liverpool

The New Antwerp Telephone and Electrical Works . . . . . Antwerp

Common Battery System in New Rockford

North Dakota Town of Two Thousand Now Boasts Modern Telephone Equipment; Jay Houghtaling of the Kellogg Switchboard and Supply Company, Chicago, Tells of Installation and Sketches Early History of Telephony in New Rockford.

The Dakota Public Service Company cut over their new telephone system at New Rockford, N. D., on April 4. The cut over was the climax to six months of intensive remodeling of the entire system. New Rockford now rightfully boasts of having one of the finest telephone exchanges in the northwest. The cut over was made without interfering in any way with the service of their patrons, and the exchange is now working in splendid shape.

Frank Milhollan, president and general manager of the Central West Public Service Co., Omaha, Nebr.

New Rockford, N. D., with a population of over two thousand, is the county seat of Eddy county, situated on the James river, thirty miles southwest of Devils Lake. The town is located in the midst of a very prosperous farming country and supports one good-sized flour mill and a number of creameries. Both the Great Northern and Northern Pacific Railroads pass through the town.

Back in 1902, when New Rockford was still a part of New Rockford independent township, Messrs. J. W. Noxon and Sam Oglesby of Valley City went before the township supervisors to secure permission to build a telephone plant. After these two men secured the necessary permission, they installed the first telephone system for New Rockford. The first manager was Mr. Williams Brueske, who was later succeeded by Mr. Albert Fairbanks. Starting with only a permit to build an exchange, Nixon and Oglesby were successful in obtaining 113 local subscribers and four rural lines with about eighty subscribers, by the end of the first two years.

Mr. Henry W. Wilson purchased the New Rockford exchange in 1904. The following year Mr. Wilson installed a new switchboard and moved the office to more convenient quarters in the Maddox block, where it remained until 1909, when the present telephone building was erected. The telephone company continued to increase the number of subscribers during the twenty-six years Mr. Wilson remained in charge.

In June, 1928, the exchange was sold to the Dakota Public Service Company. There are now over 400 local subscribers, and 14 rural lines with approximately 240 rural subscribers.

Anticipating future requirements for New Rockford, the Dakota Public Service Company has recently completed the rebuilding of the entire outside plant, replacing the old open wire leads with a modern cable distribution system. Arrangements were made with the Otter Tail Power Company to place the telephone distribution system on their poles, resulting in a neater, more efficient, and a more economical plant. The telephone building was also remodeled in order to handle more satisfactorily the new common battery service.

Representatives of the telephone company interviewed practically every subscriber in order to ascertain the type of service desired. The purpose of this canvass was to determine how favorable the reaction would be for common battery service. The city council, the Kiwanis Club, and an almost unanimous expression from the subscribers showed their approval of the new type of service after they were acquainted with the details.

With this information, and knowing that their subscribers would welcome common battery service, the Dakota Public Service Company ordered a new Kellogg two-position universal switchboard and telephones from the Kellogg Switchboard and Supply Company of Chicago, which was to be delivered to the New Rockford, N. D., exchange.

The Kellogg switchboard recently installed in New Rockford represents the latest and most successful common battery board obtainable for this size of an exchange. A number of features, new to New Rockford subscribers, that are incorporated in the board include a prompt answer, a fast connection, an uninterrupted conversation, and efficient operation of ringing. The board is equipped with line lamp distribution, automatic machine ringing, and revertive ringing tone.

The switchboard equipment is housed in a beautiful cabinet of quarter sawed oak, having an ultimate capacity of 1,200 common battery local lines. It is equipped at present with 400 common battery local lines, and wired for 60 and equipped with 30 magneto rural and toll lines.

F. M. Parsons, general plant superintendent of the Central West Public Service Co., Omaha, Nebr.

The board, as a whole, consists of the most modern machinery applied to the business of talking. It is designed to give quick and efficient service to the subscribers.

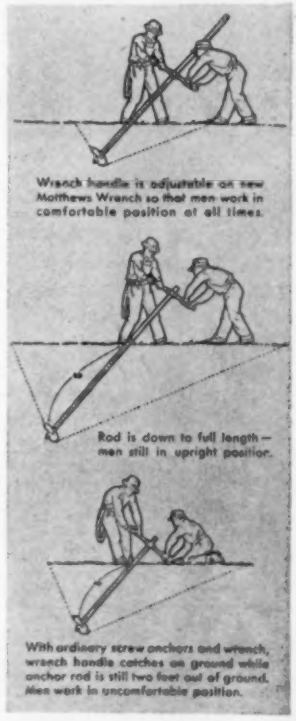
The Dakota Public Service Company is a subsidiary of the Central West Public Service Company, Omaha, Nebr., of which Mr. Frank Millhollan is president. The company furnishes telephone service in a large number of towns in North Dakota, including Devils Lake, Cando, Langdon, Cabalier, Neche, Osnabrook, Bathgate, Hamilton, Milton, Fordville, Pisek, Forest River, Inkster, Luverne, Pillsbury, Hanaford, Sutton, Dazey, Fingal, Towner, Maxbass, Westhope, Antler, Barton and Bantry. The company also operates about 500 miles of rural lines in the northwestern part of the state with connections at Kenmare and Bowbells.

While one of the youngest operating utilities in North Dakota, the company has surrounded itself with an operating

Matthews Scrulix Anchors

go all the way down—quickly

Full rod length installations mean greater holding power. Matthews Scrulix Anchors guarantee 50% greater, but many tests show as much as 100%. By using the 6810 Matthews Wrench, the malleable Matthews Scrulix Anchors are easy to screw all the way down—providing an installation of about two feet deeper because with the ordinary screw anchors it is exceedingly difficult to get a six-foot anchor down more than four feet. Hard pan, baked clay and disintegrated rock installations are made easy by first boring a small pilot hole with the 381 Matthews Hinglox Earth Auger. For complete information on these Matthews Specialties, send for Bulletin 803.


Wrench handle is adjustable on new Matthews Wrench so that men work in comfortable position at all times.
Rod is down to full length—men still in upright position.
With ordinary screw anchors and wrench, wrench handle catches on ground while anchor rod is still two feet out of ground. Men work in uncomfortable position.

W. N. MATTHEWS CORPORATION

Engineers and Manufacturers

ST. LOUIS, MO.

Kellogg two-position Universal switchboard similar to that recently placed in service in New Rockford, N. D.

personnel, who is constantly on the alert to furnish adequate service at reasonable rates. The construction program practically completed in New Rockford is only a part of the development work to be undertaken by this company.

Devils Lake, N. D., is district headquarters for a large portion of the company's property in North Dakota. The exchange at Devils Lake operates a six-position Kellogg service switchboard. Mr. W. A. Martin, a resident of the state for many years, is district manager of the company. He previously operated the telephone and electric properties at Cando and other points.

G. R. Kennedy, the local manager at New Bedford, is a telephone man of several years experience, and with the aid of his able assistants, is making it his business to take care of the wants and desires of the people of New Rockford.

Other employes who are devoting their entire time to furnishing efficient and profitable service to New Rockford subscribers are Mrs. Leona Jahnke, Katherine Boyle, Mildred Litlethan, Clara Withe and Vida Wilson.

While the physical cut over of the new service was made on April 4, the formal opening was held April 10, and many of the town's citizens availed themselves of the opportunity to view the new plant. The public was invited to inspect the new equipment and especially to watch the actual operations incident to the completing of local and long distance calls.

"KIDDING OURSELVES AND SERENADING THE TELEPHONE COMPANY"

The Jamestown (N. Y.) Evening News of November 24, 1930, carried the following story regarding new apparatus installed by the Jamestown Telephone Corporation, of whom John Wright is president:

"Uh huh! We've been fooled! The dial telephone did not displace the hello girl in Jamestown. She is still in evidence, at least she was last evening. And she is on the job with more zest than ever. It was the "voice with a smile" that came in on our party line last evening and to our dismay this is what she said: 'This is the supervisor speaking, you have been holding this line for more than five minutes, will you please release it?'

"We had been led to believe that when the dial system was put to work we could talk on party lines as long as we desired and there would be no one to interfere. We have been disillusioned. The telephone company has put one over on us. And how do you think they did it? A Journal reporter investigated and found that the telephone company has installed an automatic machine for watching and timing conversations on party lines.

"We know they have such a machine, for we have seen it with our own eyes. We saw it working, too. Right in the center of the second floor of the new telephone building is mute evidence of what the telephone company is doing to us party line people. Here we found an intricate machine about three by six feet and 10 feet in height, enclosed in a glass case. It is composed of wires, relays, a small motor, revolving shafts, and whatnot, and the whole thing is attached by long cables to the party lines. As soon as a party line subscriber makes a call one of these relays cuts in on the line and automatically starts a shaft revolving. On this shaft is a wheel which revolves once every five minutes. When it makes a complete revolution it closes a circuit that lights a lamp in front of a supervisor and it is then that we hear the sad news that we have been holding the line too long and must give it up.

"Fool the telephone company? No it just can't be done. So if you happen to be on a party line, beware, for the automatic machine will catch you if you hold the line for more than five minutes."

NEW YORK TELEPHONE COMPANY AUTHORIZES EXPENDITURES

The board of directors of the New York Telephone Company authorized the expenditure of $2,540,580 for new construction throughout the state, at the regular monthly meeting held October 22nd, according to an announcement by J. S. McCulloh, president. This brings the total appropriations since the beginning of the year to $83,228,340, of which $68,395,190 has been provided for the extension of facilities in the metropolitan area.

OKLAHOMA EXCHANGE TO HAVE STROMBERG EQUIPMENT

Standard Telephone Company of Texas recently contracted with the Stromberg-Carlson Telephone Mfg. Company for three sections of No. 3 unit type switchboard for its exchange at Waynoka, Oklahoma. The board will consist of 400 Central Energy, 32 Rural and 8 Toll Lines and will be complete with power, terminal and machine equipment.

PUBLIC LIABILITY PROPERTY DAMAGE

PUBLIC LIABILITY PROPERTY DAMAGE

Thrifty Bill Says

"To Insure is to Make Sure"

THAT IS JUST WHAT INSURANCE MEANS TO YOUR BUSINESS—

MAKING SURE

Let us show you how we can effect a substantial saving in the cost of your Insurance.

A post card will bring the figures

LYNTON T. BLOCK & CO.
ST. LOUIS, MO.
UNDERWRITERS OF SELECTED CLASS INSURANCE AT A SAVING

511 Locust St. **St. Louis, Mo.**

Specialized Insurance for Telephone Co.'s

WORKMEN'S COMPENSATION AUTOMOBILE

Jefferson City Opens New Central Office

Capital City Telephone Company of Jefferson City, Missouri, Installs Stromberg-Carlson Super-Service Equipment in Missouri's Capital. Improvements Total One-quarter of a Million Dollars.

By P. WINEMILLER, Sales Representative
J. P. GALLIGAN, Missouri Representative
Stromberg-Carlson Telephone Mfg. Co.

OFFICERS AND BOARD OF DIRECTORS OF THE CAPITAL CITY TELEPHONE CO.
Reading from left to right: Houck McHenry, president, manager and member of Board of Directors. Mrs. Houck McHenry, member of Board of Directors. Mrs. Z. G. Parker, member of Board of Directors. Clark Silvey, plant superintendent. Lester S. Parker, member of Board of Directors. Foster McHenry, secretary and assistant manager.

"It has been said that every enterprise is but the lengthened shadow of a man. I can think of no other expression which so aptly fits the Capital City Telephone Company and Houck McHenry's connection with it."

This was the fine tribute paid to Houck McHenry, manager of the Capital City Telephone Company of Jefferson City, Missouri, at a banquet celebrating the opening of the new and magnificent home of that company on November 12, by W. Roy McCanne, president of the Stromberg-Carlson Telephone Mfg. Company.

The banquet was given in honor of Mr. McHenry and his son, Foster McHenry, secretary of the company, and was a fitting finale to the three-day open house during which the public was invited and urged to inspect the new and modern telephone building and the new Stromberg-Carlson Super-Service equipment installed therein.

Two hundred and fifty people, including distinguished state and local officials, leaders in the telephone industry and employes of the Capital City Company, attended the banquet which was given in the spacious banquet hall of the Missouri hotel.

The hall was appropriately decorated for the occasion and a delicious dinner was prepared and served by the management of the popular hostelry. W. B. Malone, a leading business man of Jefferson City, was chairman and toastmaster.

In addition to Mr. McCanne and Mr. Malone, several other leaders paid glowing tribute to the ability, business integrity, leadership and progressiveness of Messrs. Houck and Foster McHenry, and highly praised the elegant new building erected through their enterprise.

Governor Henry S. Caulfield was one of the principal speakers of the evening and told of the wonderful service the Capital City Company had given Jefferson City and the surrounding community, praising the McHenrys for the work they had done to give their community the best in telephone service. He also told of the high standing that these men held in their community and the entire state of Missouri.

Other speakers were J. H. Agee, general manager of the Lincoln Telephone and Telegraph Company, of Lincoln, Nebraska; A. B. Elias of St. Louis, president of the Southwestern Bell Telephone Company, and M. L. Galloway, Holden, Missouri, president of the Middle States Utility Company. Local spokesmen were Lieut.-Gov. E. H. Winter, N. W. Simpson, C. C. Carson and J. Kelley Pool.

Among others who attended the banquet were H. O. Lineard of Cleveland, assistant vice-president of the American Telephone and Telegraph Company; V. M. Carroll of St. Louis, assistant to the president of the Southwestern Bell Telephone Company; C. A. Vedder of St. Louis, assistant vice-president of Southwestern Bell Telephone Company; A. J. Roberts, manager; C. D. Kinne, assistant manager, P. Winemiller, sales engineer, and J. P. Galligan, sales representative of Stromberg-Carlson's Kansas City office, and E. R. Stonaker of Rochester, New York, consulting traffic engineer of the Stromberg-Carlson company.

A group of Jefferson City business men, "The Schnitzelbankers," known throughout that part of the country for their melody and fun in song, provided the entertainment and comedy skits were presented, featuring the new building, equipment, officials of the Capital City Company and members of the Stromberg-Carlson Company.

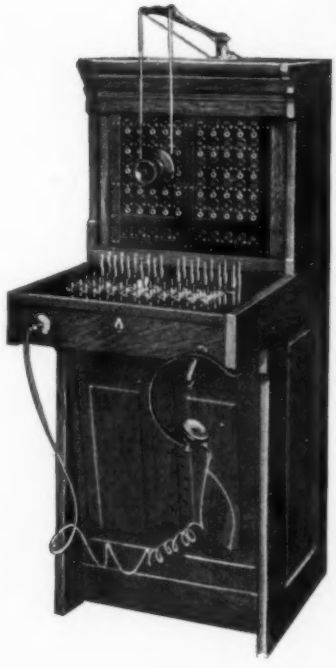
More than 3,000 people swarmed into the new building during the three-day open house. The public was very much interested in the new and modern equipment which is now providing them with the best of service and immediately put its stamp of approval on the new switchboard and highly praised the McHenrys for giving them the improved service. Mrs. Houck McHenry and Mrs. Z. G. Parker, both of whom are on the board of directors of the Capital City Telephone Company, proved to be delightful hostesses to the multitude which inspected the new building. Refreshments were served daily from 9 a. m. to 5 p. m.

The cut-over from the old equipment to the new was made at 1 a. m. Sunday, November 8, and was established without the slightest delay in service. The cut-over was featured by the placing of the first call over the new equipment by Governor Caulfield, who carried on a long distance conversation with Col. Arthur Wood, recently appointed chairman of the National Unemployment Committee by President Hoover.

Jefferson City has been long the center of a most prosperous, diversified agricultural territory. Corn, one of the principal crops, is raised on an extensive scale, especially in the fertile valley lands. There is also considerable truck farming and dairying.

The city is located 125 miles west of St. Louis and 160 miles east of Kansas City. According to the latest census, the

Would You, Too, Like to Make the Savings Mr. Irwin Did?



JOHNSON COUNTY TELEPHONE CO.
AND
VALLEY TELEPHONE CO.
PAINTSVILLE, KY.

May 17, 1930.

Suttle Equipment Co.,

Lawrenceville, Ill.

Gentlemen:

In early part of 1929 we purchased of you a small switchboard, rebuilt by you, which has given entire satisfaction. In fact a new board could not have been better, and there was certainly a very nice saving in price as compared to the price of a new board.

We have also bought several of the rebuilt telephones from you which have proven satisfactory and look like new sets.

"Suttle Service" is no idle boast; we know by actual experience.

Yours very truly,

W. H. Irwin, Manager,
Johnson County Telephone Co.

THE above letter tells the story of the savings that you, too, can make in replacing your old, worn-out switchboard.

Suttle switchboards are from every practical standpoint the exact equal of brand new switchboards. All the parts that can show wear have been replaced with brand new parts. The wiring, springs, thimbles, plugs and cords are always new in these boards and can be relied upon to give dependable service for a period of many years. The cabinets are always completely refinished and look just like new.

Send for our latest price list on boards carried in stock and see for yourself the remarkable savings you can make just as the Johnson County Telephone Company made.

SUTTLE Rebuilt Switchboards are carried in stock in all sizes—10, 20, 25, 40, 50, 60, 80, 100, 120, 150, 210 lines. Send coupon to the right for complete information and latest price list just off the press.

SUTTLE EQUIPMENT COMPANY,
Lawrenceville, Illinois.

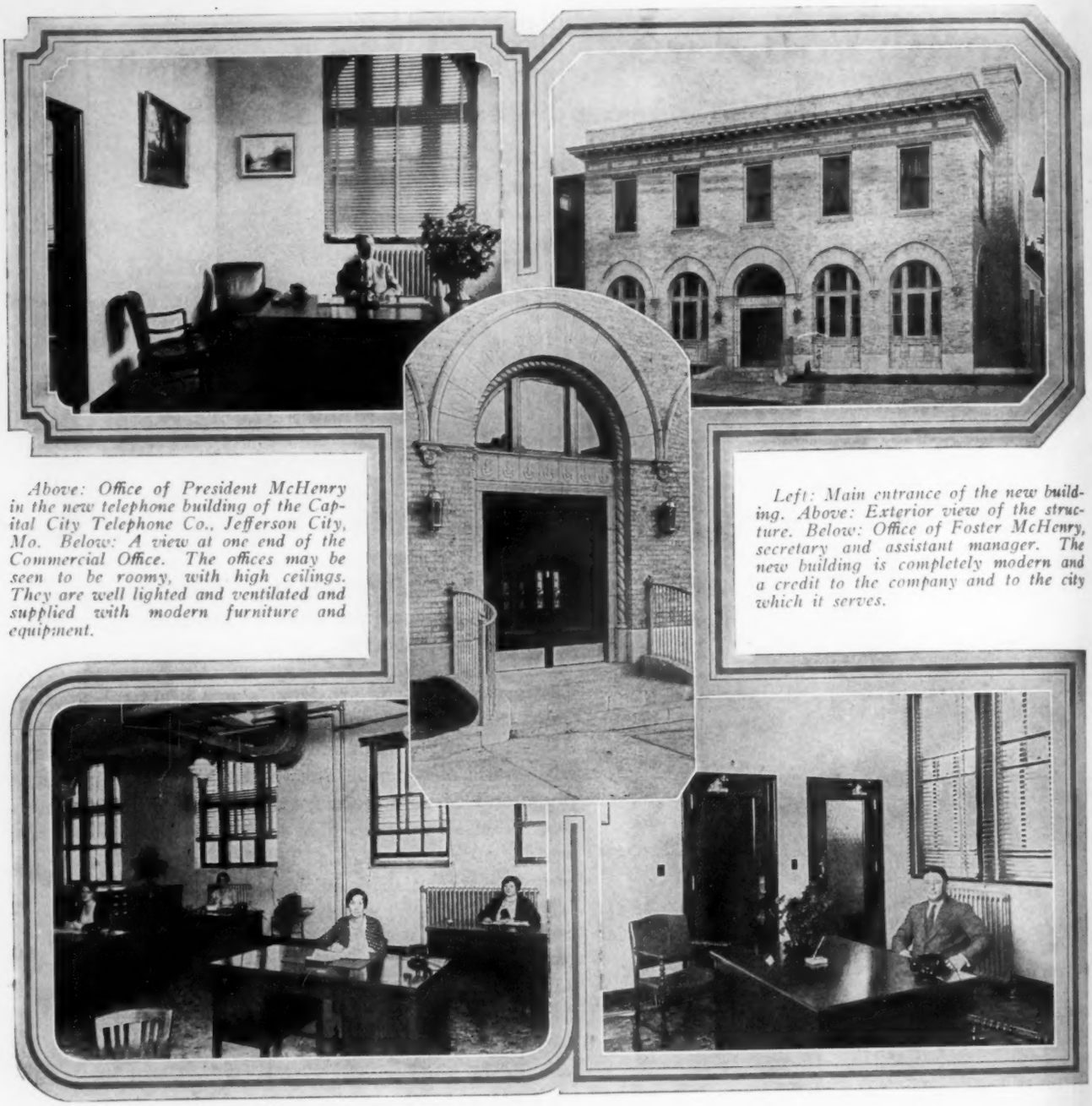
Please send us your special book on Suttle Rebuilt Switchboards with price list and full information on boards you have in stock.

Company .....

Address .....

Manager .....

Suttle Equipment Co.
Lawrenceville, Illinois



Above: Office of President McHenry in the new telephone building of the Capital City Telephone Co., Jefferson City, Mo. Below: A view at one end of the Commercial Office. The offices may be seen to be roomy, with high ceilings. They are well lighted and ventilated and supplied with modern furniture and equipment.

Left: Main entrance of the new building. Above: Exterior view of the structure. Below: Office of Foster McHenry, secretary and assistant manager. The new building is completely modern and a credit to the company and to the city which it serves.

city has 21,615 population, an increase of 49 per cent in the past ten years.

The Capital City Telephone Company has experienced a rapid growth as has the city in which it is located. The company which was founded in 1900 and which has been under the direct management of Houck McHenry practically since its beginning, has been improved and developed to take care of its ever increasing business caused by the rapid growth of the city.

The first headquarters for the telephone company was on the second floor of a small business house. At that time there were 100 stations. Constantly increasing business necessitated moving into the home of the old Missouri Volksfreund on Madison street in 1908. The company remained in their quarters until the recent cut-over and in that time increased its list of subscribers to 4,948. This represents a telephone development of 23 per cent, whereas the average in cities under 50,000 population throughout the country is only 12.8 per cent.

Today the business of the company is managed by a board of directors consisting of Houck HcHenry, president and manager; Foster McHenry, secretary and assistant manager; Lester S. Parker, Mrs. Z. G. Parker and Mrs. Houck McHenry. Houck McHenry has for years been an outstanding figure in the Independent telephone operating field.

Mr. McHenry was born in 1868 at Kansas City and, when he was eight years of age, he moved with his parents to Jefferson City. He received his education in that city and was graduated from the Jefferson City high school in 1884. Six years later he was married to Miss Thenia Bolton of Jefferson City.

He was connected with the Missouri railroad for 20 years as soliciting freight agent. In 1900 he, with six other leading citizens of Jefferson City, organized the Capital Telephone Company and in 1905 he was made manager and secretary of the company. Upon the death of L. S. Parker, president of the company, in 1925, a new company was formed under the name of the Capital City Telephone Company, which purchased the assets of the Old Capital company. Mr. McHenry was elected president and manager, which position he still holds.

Mr. McHenry has been president of the Missouri Independent Telephone Association for twenty-six years and, at the

STROWGER'S APPEAL TO THE CRAFT

RISING in the heart of London and dedicated to a worthy ideal, the great Masonic Peace Memorial is to be representative of the best in craftsmanship and material that the world produces.

It followed therefore that Strowger Automatic Dial Telephones were selected for the interdepartmental communications and will prove of lasting service to the organization of the British headquarters of Freemasonry.

AUTOMATIC TELEPHONE MANUFACTURING CO., Ltd.
STROWGER WORKS, LIVERPOOL, ENGLAND
Associated Company: International Automatic Telephone Co., Ltd., London

MASONIC PEACE MEMORIAL, GREAT QUEEN ST., LONDON.

SECRECY · FIDELITY OBEDIENCE

Left to right on top: View showing toll board in operation in the office of the Capital City Telephone Co., Jefferson City, Mo. View showing Stromberg-Carlson super-service switchboard in operation. Left to right on bottom: View in the new telephone building showing the power and ringing equipment and wire chief's desk. Two hundred fifty prominent state and city officials and employes attended the banquet given in honor of Houck McHenry and Foster McHenry.

State convention last year, he was presented by his associates with a silver plaque as a tribute to his loyal and faithful service "to the telephone cause." Mr. McHenry naturally regards the plaque with pardonable pride and it hangs in his office in the new building. After serving several years as a director of the United States Independent Telephone Association, Mr. McHenry was this year elected its first vice-president. He is a member of the Shriners, Elks, Knights of Pythias, Odd Fellows, Chamber of Commerce, of which he was president for three terms; board of trustees of the Baptist Church and of the Jefferson City Country Club.

The decision was based on the idea that, as he expressed it, "That service is best which serves most," and his desire to render that kind of service to his subscribers—a real service at a reasonable rate.

Foster McHenry was born in 1895 at Jefferson City and was graduated from the Jefferson City high school in 1911. He received his A. B. degree from William Jewell College in 1914, finishing a four year course in three years.

Since 1915 he has been associated with his father with the exception of five years which he spent in the insurance business. In 1915 he was elected secretary and assistant manager of the Capital City Telephone Company. He is a Royal Arch Mason, vice-president of the Kiwanis Club, member of the Chamber of Commerce and the Jefferson City Country Club.

Mr. McHenry is carrying forward the same policies and high principles in association with his father in management of the company's affairs.

In Clark Silvey, the Capital City Company has a first class plant superintendent who carries out the policies established by the Messrs. McHenry and maintains the equipment in the best of condition in order that subscribers will receive the best of service.

Mr. Silvey has had experience in every technical branch of telephony. Educated in the Jefferson City schools, he was employed by the Star Dynamo Company for two years, from 1916 to 1918, and was associated with the International Shoe Company for one year.

In 1919 he was employed by the then Capital Telephone Company as cableman helper. Later he was made an installer, trouble man and cableman. In 1928, he was promoted to plant superintendent, which position he has since held.

Realizing that the steady growth of Jefferson City would mean increased business for the company, the board of directors decided it should replace its equipment with the most up-to-date equipment in order to give the city and community the service it commanded. However, before coming to any decision the board made a complete study of every type of telephone switching equipment, the result of which was their decision in favor of the modern manual type. After further exhaustive studies of this type of apparatus, the board contracted with the Stromberg-Carlson Telephone Manufacturing Company for the installation of complete central office equipment, both local and toll, the local equipment being the well-known super-service switchboard which contains every feature for fast and accurate service.

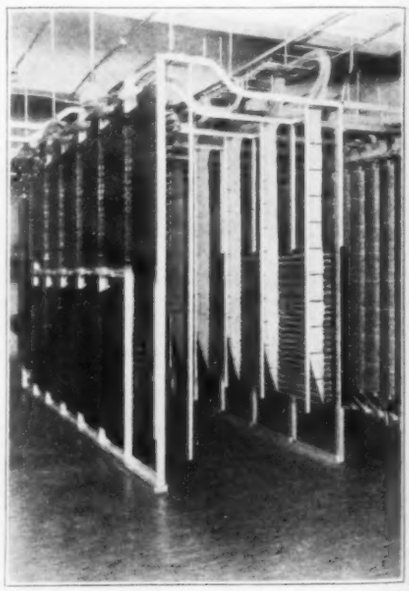
In addition to the new central office equipment, the board decided to install underground cables throughout the business district of the city.

Tentative plans for a new building had been in the making for some time and as soon as the type and make of equipment were decided upon the plans were rapidly completed and work started upon the new home. Today the Capital City Company has a building which provides ample accommodations for the present and future needs of both the mechanical equipment and business offices of the company.

The total cost of the improvements amounted to one quarter of a million dollare, giving Jefferson City a telephone system on a par with that of any city of comparable size in the country. It is a further acknowledgment to the confidence which the people of Jefferson City have in their telephone company and its directing heads that by far the majority of the preferred stock which was issued to finance this expansion was quickly subscribed to by local people and local interests.

Jefferson City has always boasted of many fine buildings, notable among which is the Capitol building, generally considerad as rating, from an architectural standpoint, close to the top among buildings of this type in the country. Into this setting the new telephone building fits admirably, a credit in every respect to the city it serves. It is situated on Madison street, adjoining the location of the old building.

Built of reinforced concrete construction, faced with ornamental brick of special manufacture and matched coloring and with terra cotta trim, it is a two-

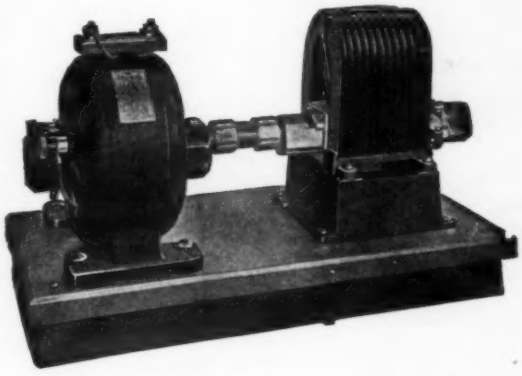


View showing relay and terminal racks in the home of the Capital City Telephone Co., Jefferson, Mo.

HOLTZER-CABOT

Magneto - Ringing - Motor - Generators

Maintain Better Service



Maintaining an efficient, economical, carefree ringing service need not be a problem—but it does require good judgment in selecting your equipment.

Install Holtzer-Cabot Magneto Ringing Motor Generators. These units will enable you to dispense with battery maintenance and constant service diligence. Can be supplied for any voltage or special current.

We invite correspondence. Complete data on request.

HOLTZER - CABOT ELECTRIC CO.

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THE PERFECT FLUX-CORE SOLDER
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ALL TELEPHONE USES

KESTER was the first Flux-Core Solder made. It is as near absolute perfection as human ingenuity can make it. When better solders are possible KESTER will make them. With that assurance, accepting KESTER SOLDER as the standard is only good business on your part.

Hundreds of others are saving time and money and doing better work with KESTER SOLDER. You can do the same.

There is a KESTER SOLDER for every job and your jobber has what you need now in stock.

KESTER SOLDER COMPANY
INCORPORATED 1899
4218 Wrightwood Ave., Chicago

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ST. LOUIS AND KANSAS CITY IN MISSOURI

18th and Pine St. Opened March 1928

13th and Wyandotte In the Heart of America

SAN ANTONIO AND LAREDO IN TEXAS

A City of charm On the Old Spanish Trail

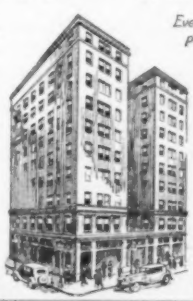
On the Rio Grande and the Mexican Border

Garage Service

Every room with private bath & ceiling fan

WE QUOTE OUR TOP PRICE

$2.50



A MATTER OF ECONOMY

$2.00

PERCY TYRRELL
President

HEADQUARTERS

FOR TELEPHONE MEN

HOTEL SHERMAN

DRIVE Your Car Right into Hotel Sherman

Single Room with Bath $2.50 a day and up

Double Room with Bath $4.00 a day and up

RANDOLPH · CLARK · LAKE · LA SALLE · STREETS

CHICAGO

story and basement structure. The utilitarian blends with the artistic in as fine a telephone building as exists in any single office city.

The building has a 55 foot frontage on the southeast side of Madison street. Set back from the sidewalk a distance of six feet, it has a further depth of 87 feet. Plenty of room for growth is allowed in the rear. There is a small grass plot in the six foot space between the sidewalk and the front wall of the building.

The lobby has a terrazzo floor and a base and wainscot of marble. The public space has a cement floor, covered with battleship linoleum and also has a marble base. The entire space behind the counter has been left open and serves as both public commercial office and commercial work office, where the auditing, accounting and commercial detail work is handled.

The terminal room is to the rear of this group of offices, occupying the full width of the building and extending to the rear wall. There is an entrance to the terminal room from the front lobby through the commercial work office. There also is an entrance direct into the terminal room from the rear of the building.

This room houses all the terminal and power equipment for both the local and toll switchboards. It also houses considerable repeater and toll line apparatus, for Jefferson City is about in the middle of the large toll line cable being built across the state of Missouri, between St. Louis and Kansas City, by the Southwestern Bell Telephone Company.

The dimensions of the operating room are 62 feet by 32 feet. In it both the local and toll switchboards are installed. The twelve position Stromberg-Carlson super-service switchboard is installed to grow from left to right along the northeastern wall of the room. The twelve position toll board is installed on the opposite side of the room, to grow from right to left along the southwestern wall. There is enough space in the operating room for the local board to double in size and for the toll board to increase 75 per cent. It is estimated this will take care of many years' growth

The new equipment installed in this beautiful building can best be described by a statement made by Mr. Elias in his speech at the banquet. In his talk he highly praised the new plant and made the following statement, which reflected much credit on the management of the Capital City Company:

"Others speaking before me have said this new building and equipment are as fine a layout as can be found in any city the size of Jefferson City in the state of Missouri and in the Southwest, but I would like to elaborate still further upon this statement and say that I believe that the entire set-up is as fine as any that can be found in any city the size of Jefferson City in the country."

The Stromberg-Carlson Super-Service switchboard is equipped with all the features which have been developed to insure both speed and accuracy in switchboard operation. Many of these features are new to the art and are a marked improvement over those found in older types of switchboards.

All the twelve positions of the Super-Service switchboard installed at Jefferson City consist of high efficiency local cord circuits including the following features:

Operator's Cut-in, Operator's Bar, Advance Plugging-in, Operator's Listening Indication, Operator's Secret Service, Audible Busy Test, Operator's Ringing Control, Machine Ringing, Ringing Tone, Instantaneous Ringing Cut-off, Calling Subscriber's Ringing Control, Reverting Call Ringing, Dark Keyboard, Positive Supervision, Instantaneous Disconnect, Instantaneous Recall, Flash Recall, Call Registration and Emergency Ringing.

The board installed at Jefferson City is of the same type as those in operation in exchanges of the Rochester (N. Y.) Telephone Corporation and was developed after intensive studies made by Stromberg-Carlson engineers in conjunction with engineers of the Rochester Telephone Corporation.

One exclusive Stromberg-Carlson feature on the board is the cord trench running the length of the switchboard which, while allowing ample depth for the cords, permits the use of a low keyshelf. The operators sit in low chairs in restful positions with their feet on the floor. This is another feature of the board which insures better service as it lessens tension to which the operators are subjected at the ordinary high keyshelf switchboard.

The few weeks the new system has been in operation have brought many complimentary statements and letters to the management of the Capital City Company, praising the improved service rendered by the new equipment.

Missouri Telephone Association Holds Annual Meeting in Kansas City

Study classes where telephone men might study and learn more about their chosen profession characterized the annual meeting of the Missouri Telephone Association held at the Hotel President, Kansas City, November 18 and 19. The attendance totaled more than 350, fully half of whom enrolled in the operators' school and conference, inaugurated three years ago, or the lineman and trouble-men's school and conference, which originated last year.

Houck McHenry of Jefferson City was re-elected president of the association and other officers were chosen as follows: A. M. Benedict, Richards, first vice-president; F. M. Browne, Clarence, second vice-president; G. W. Schweer, Clinton, third vice-president; W. E. Carlson, Rolla, fourth vice-president, and R. W. Hedrick, Jefferson City, secretary-treasurer.

Members of the executive committee were elected as follows: H. C. Todd, Maryville; M. L. Galladay, Holden, and C. A. Vedder, St. Louis, for the three-year term; Dr. S. T. Neil, Clinton, C. W. Boutin, Cape Girardeau, and E. F. Carter, Columbia, for the two-year term; C. A. Ulfers, Kansas City, S. T. Thompson, Cameron, and V. E. Chaney, St. Louis, for the one-year term.

In his annual address, President McHenry traced the growth of the Missouri Telephone Association for the thirty years since its organization, and outlined the accomplishments of the past year. Regarding the relations of telephone companies with the public, he said:

"A distinguished member of the Missoiuri Public Service Commission, who is no longer engaged in that work, once said that if the telephone service was first class and the people had an understanding of what was necessary to provide this good service, there would be little, if any, opposition to an adjustment of telephone rates that would furnish a reasonable return.

"Ours is not a secret business but one in which the general public is interested. I believe if I were to make a suggestion of one thing for the betterment of the industry, I would make no mistake in summing it up as 'take the public into your confidence.'

"Let them see what is going on in your operating room. Educate them along the lines of what it takes to produce adequate service, give them accurate information of what you are doing. Let them know that you are a part of the community life the same as the bank, the grocer, and the dry goods store."

A lesson in preparing news stories was given the delegates by Dick Smith, managing editor of the Kansas City Journal-Post. He explained the sort of material which will be run by editors as legitimate news. One illustration of telephone news given by Mr. Smith was the cutting

(Continued on page 56)

"Cope"

Patent Quick Coupling Conduit Rods

They will not come uncoupled in the duct

T. J. COPE, Inc.

Manufacturers of

Complete Equipment for Cable Installation

6122 Vine Street, Philadelphia, Pa.

19 So. La Salle Street, Chicago, Ill.

Note Protection at Corners

Blake Insulated Staples

Trade Mark

Unequalled for telephone and bell wiring. The fiber insulation prevents troublesome short circuits and grounds. 4 sizes. Pat. Nov., 1900. Write for samples.

Blake Signal & Mfg. Co.

BOSTON, MASS.

"STEWART" DETECTO-METER

The "STEWART" Detecto-Meter is guaranteed to locate those bad joints that are sure to give trouble in hot weather. One Illinois company cut out two, one bushel crates of bad wire joints all showing resistance. They brought their lines up in transmission, beyond belief.

The Detecto-Meter will also measure resistance of any part of switchboard or telephone. It has more than 100 uses around the telephone plant. It is also a 150-volt voltmeter. Sent on trial. Price $39.00.

Also lineman's Test Sets with detector coil, Cable Testers and Test Cabinets.

STEWART BROTHERS, Ottawa, Illinois

TELEPHONE WIRES and CABLES

Electrolytic Copper Rods

Bare and Insulated Copper Wires

Switchboard Cables

Rubber Insulated Wires

Magnet Wire

Flexible Cords

Enamelled Wire

Power Cables

Eugene F. Phillips Electrical Works Limited

(Established 1889)

MONTREAL, CANADA

Factories---Montreal and Brockville

Illinois Telephone Handbook Now Ready

Tenth Annual Handbook Contains Addition of Data on Fibre Conduit, Discussion of Building and Exchange Equipment and Special Article by Editor-in-Chief T. DeWitt Talmage, Entitled "Telephone Transmission Computations;" Enlarged 32 Pages.

The Illinois Telephone Handbook has been published annually for ten years not only with the thought in mind to help the beginner in telephone work but also to make available to the experienced man a handy reference book.

Because of its increased practical worth and "usability" an unprecedented demand for the ninth edition completely exhausted the supply shortly after its publication. For that reason a tenth edition was prepared and is now available for general distribution. The new edition has been enlarged and revised and is 32 pages greater in size than last year's Handbook.

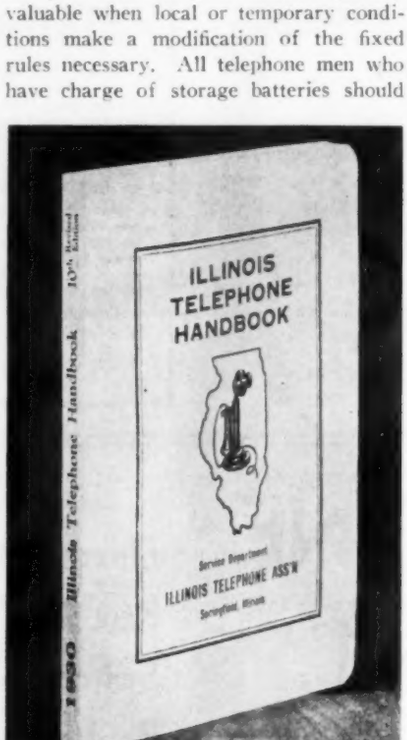
Requests for the Illinois Telephone Handbook have come from 16 foreign countries in far corners of the world. Large numbers of the Handbook have been mailed to telephone workers in Canada, Mexico, Panama Canal Zone, Hawaiian Islands and Cuba.

In this country the Handbook has been ordered for use in the largest public libraries, in universities, in the Signal Corps of the United States Army, in the signal sections of railroad organizations, in reference libraries of laboratories and state commissions, in technical libraries of manufacturers, as well as for the benefit of thousands of executives and employes in the smallest and the largest operating telephone companies.

In the tenth edition of the Handbook the material pertaining to the subjects of vitrified clay conduit and telephone transmission computations have been revised and expanded. New material has been added on the subjects of bituminized fibre conduit and the design of telephone buildings and exchange equipment. This latter subject will prove of intense interest and assistance to those who contemplate remodeling or constructing a new exchange building.

The subject of bituminized fibre conduit is a live one and an excellent discussion is included in the present edition of this helpful telephone handbook. Moreover, the installation of conduit is explained with the use of many photographic illustrations of actual jobs which materially helps in understanding this part of construction work.

One of the outstanding articles is on the subject of the care and operation of the storage battery in telephone service. If the fundamental principles of the storage battery are understood the care and operation is merely common sense. This does not mean that the daily routine care of a battery cannot be successfully handled if the attendant does not understand the fundamental principles. In fact, thousands of storage batteries are being so maintained by the attendant mechanically following a set of fixed rules, but a knowledge of the fundamentals is certainly desirable in general and especially valuable when local or temporary conditions make a modification of the fixed rules necessary. All telephone men who have charge of storage batteries should



read this discussion in the Illinois Telephone Handbook.

The very latest trends in the transmission planning of tributary trunk and toll circuits are described in the article by the Editor-in-Chief, T. DeWitt Talmage, entitled "Telephone Transmission Computations." This discussion is illustrated with two cuts showing the standard distribution of transmission loss in a connection containing one toll circuit and a chart indicating the transmission equivalents at voice frequencies for 15 non-loaded physical telephone circuits. The entire article explains the necessity for satisfactory transmission standards and includes three examples of ordinary transmission computations which will prove of interest and value to telephone companies of all sizes. The data furnished in this article is complete enough to enable the average telephone man to calculate the transmission loss of his present tributary trunk and toll circuits to determine which circuits exceed the standards discussed.

The section of particular interest to wire chiefs and troublemen is that pertaining to General Wire Data. This division has been enlarged this year to include the new specifications covering Copperweld telephone wire and strand.

The Pole Section of the Handbook is over forty pages in length which makes it the largest division of the book.

In the latter part of the Handbook consideration is given to rules for overhead line construction. This material is divided into four general sets of rules, (1) general requirements for the construction and maintenance of communication lines, (2) communication lines crossing the tracks of steam and electric railroads (3) communication lines crossing with underground construction the tracks of steam and electric railroads and (4) communication lines where alone. These rules are to be construed as a *minimum* requirement only. They are not to be construed as recognized standard construction in *all* cases. In many cases a higher grade of construction will be found more economical and advisable than that described by this set of rules.

The last article in the Handbook is an interesting and informative one covering the subject of a "Method of Determining the Dividing Line Between Depreciation and Maintenance."

As a whole the make-up and arrangement of the last edition (described in the January, 1930, issue of THE TELEPHONE ENGINEER on page 36) seemed to have met with the general approval of the large body of users of the Illinois Telephone Handbook, and many favorable comments have been received. For that reason the present 10th edition of the Handbook is practically the same in style, including the feature of seven specialized indices, namely, Table of Contents on page 13, Advertisers' Index on page 14, Rules for Overhead Line Construction Indices on pages 167, 188, 196 and 205, and a General Cross Index on page 216.

Other subjects covered in the Handbook which have not been mentioned so far in this review of the Illinois Telephone Handbook are those pertaining to service standards, ampere hour meter for automatically starting and stopping the

(Continued on page 52)

Crapo
GALVANIZED PRODUCTS

Telephone and Telegraph Wire
Extra Best Best (EBB)
Best Best (BB)
Steel

Seven Wire Steel Strand
Standard
Siemens-Martin
High Strength
Extra High Strength

Crapo Galvanized Products combine *every* element essential to long life and low maintenance cost: pure zinc coatings, *non-cracking, non-peeling*—correct tensile values—proper ductility.

Immediate shipping service from Distributors' stocks in all jobbing centers.

Manufactured Exclusively by
Indiana Steel & Wire Co.
Muncie, Indiana

HOTEL HARRISON

CHICAGO'S NEWEST DOWNTOWN HOTEL

RUNNING ICE WATER IN EVERY ROOM
$2.50 AND $3.00
WITH BATH
NO HIGHER

RADIO IN EVERY ROOM

NO PARKING WORRIES
DIRECT ENTRANCE FROM HOTEL TO HARRISON PARKING GARAGE

HARRISON STREET JUST OFF MICHIGAN BOULEVARD

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TESTS* *Prove* THEY'RE BETTER

*[U. S. Government Standards]

YOU *know* what you're buying when you buy Ray-O-Vac Telephone Batteries . . . searching tests such as those used by the U.S. Bureau of Standards show Ray-O-Vacs markedly ahead in long-life, in sustained current output, in voltage staying power.

Why experiment? Standardize on these *proved-quality* batteries. They cost no more!

FRENCH BATTERY COMPANY
MADISON, WISCONSIN
General Sales Office: 20 North Wacker Drive, Chicago

RAY-O-VAC

"A", "B" and "C" Radio Batteries; Autoradio and Aircraft Radio Batteries; Telephone, Ignition and Flashlight Batteries; Rotomatic and Standard Flashlights; Electric Lanterns; Licensed Radio Tubes.

News From the Field

Pleas for an interlocutory injunction to temporarily prevent the public service commission from interfering with proposed rates of the Southern Indiana Telephone and Telegraph Company were denied in the federal court at Indianapolis by Judge Will H. Sparks, Judge Robert C. Baltzell and Judge Thomas W. Slick.

The Ohio Bell Telephone Company has called all outstanding seven per cent preferred stock by Jan. 1 at $105. Retirement will require $28,219,700, but no new financing is contemplated.

The Indiana Bell Telephones Company will make improvements to the Peru, Ind., exchange, at cost of $35,000. This will give employment to 40 Peru men.

The development of Trans-Atlantic communication, which actually began over twenty years ago, and the latest achievements in linking America with Great Britain, were told members of the Mattituck Chamber of Commerce, Mattituck, N. Y., at a recent meeting, by P. B. Smith of the New York Telephone Company.

Sites for radio stations for telephone service across the Pacific ocean have been purchased by the Transpacific Communications Company, Ltd., a subsidiary of the American Telephone & Telegraph Company, according to officials of the company. Erection of the stations will begin early next year, and service between the United States and Hawaii is scheduled for January, 1932.

The Catholic church is in the "vanguard of progress," Pope Pius declared when he inaugurated the Vatican City telephone system. The Pope himself threw the switch that placed the telephone system in operation. Telephones were recently installed in the vatican for the first time in history.

The Illinois Bell Telephone Company has 35 men at work in Vandalia, Ill., erecting 260 new and larger poles to replace the old ones. Cables will be used largely. The same poles will be used by both the telephone company and the Illinois Power & Light Company.

The board of directors of the Citizens' Mutual Telephone Company of Bloomfield, Ia., have voted to erect a new building to house the company and to purchase a new switchboard for the system. Work is to be started at once on the structure, which will be of brick and tile, two stories and a basement, 23 feet wide by 32 feet deep.

Merger of five telephone companies serving 3,000 subscribers in Mercer and Van Wert counties, Ohio, into the Ohio Cities Telephone Company, has been announced by Paul Christy of Celina, manager. The companies merging are: Mendon Telephone Company, Celina and Mercer County Telephone Company, Ohio City Telephone Company, Wilshire Telephone Company, and Wren Telephone Company.

Telephone service at Lima, Ohio, was seriously crippled for more than a week in November by a fire which damaged the exchange considerably. Service was temporarily resumed after several days through the ingenuity of Arthur C. Stuart, equipment engineer, and Guy Brentlinger, maintenance engineer, who worked out a system for substituting human labor for automatic machinery damaged in the fire. Until the equipment for permanent repair arrived, subscribers were asked to eliminate all but very important telephone calls.

The new $350,000 building of the Grand Haven branch of the Michigan Bell Telephone Company was opened with a formal ceremony at which Mayor Bruno Peter made the first official telephone call.

The most extensive cutover of telephone service in Minneapolis since the downtown exchanges were changed from manual to dial telephones took place recently when the Northwestern Bell Telephone Company's toll lines were hooked up with a new switchboard, installed to care for growing long distance business in and out of the city at a cost in excess of $650,000.

Rapid progress is being made in the reconstruction work of the Aledo lines of the Western Illinois Telephone Company, according to Charles Holsclaw, Galesburg, Ill., manager.

More than $165,000 will be spent on a telephone improvement program involving extension and reconstruction of the long distance line between Carroll, Ia., and Atlantic, Ia., according to J. P. Steffens, Atlantic manager for the Northwestern Bell Telephone Company.

The Michigan Bell Telephone Company has assumed ownership and operation of the Thumb Telephone Company, which operated exchanges in Port Sanilac, Mich., and Applegate, Mich., according to H. J. Consfield, Port Huron, Mich., area manager for Michigan Bell.

Walter S. Gallemore, formerly manager of Central Missouri Telephone Company, has joined the Municipal Telephone and Utilities Company of Chicago as assistant general manager to H. L. Housley, who is in charge of operation of all the company's properties.

Citizens of Enterprise, Ala., were without telephone communication for three weeks in November, due to fire which originated in the telephone building and completely destroyed the switchboard and other equipment.

A vigorous battle between opposing factions of the Clay county board of commissioners, Clay county, Nebr., resulted in defeat of a proposal to authorize the board to build and operate a county telephone system. Clay is the fifth county in Nebraska to vote down county telephone ownership proposals.

In an effort to aid unemployment the Hermosa Telephone Company, Hermosa, Ia., is building a new line to Spring Creek and a special wire extended to a private ranch near Hermosa. Other improvements will include extension of the line to the Spokane mine and improvements in the Fairburn and Hermosa central units.

The telephone is gradually supplanting the telegraph as a means of train dispatching, says an editorial in the Tampa, Fla., Times. "In using the telephones less time is necessary, less training is required to handle telephones efficiently, and there is less physical and mental strain on dispatchers in making calls."

Investigate Our Centralized Accounting Plan

This monthly Audit will save you lots of money and give you important information that you should have about your business—the best of all business, if properly managed.

BOWDLE ACCOUNTING SYSTEM
CERRO GORDO ILLINOIS

International Poles in service 30 years and still strong prove the economy of International Methods

This dating nail in poles is your protection against inferior timber and treatments.

International Creosoting & Construction Co.
General Offices—Galveston, Texas
Plants; Texarkana—Beaumont—Galveston

Get EVER-PROTECT aid in your construction.

EVER-PROTECT has proved practical and profitable in making many hundreds of cable installations underground without a conduit. It protects cable against storm damage, corrosion, chemical action, electrolysis and abrasion.

In liquid form EVER-PROTECT is great for overhead work, protecting your cable and messengers against chemical action and other destructive influences.

Ask your nearest jobber for complete details.

EVER-PROTECT CABLE COMPOUND
TRADE MARK REG. U.S. PAT. OFF.

National Cable Compound Co.
Incorporated
MITCHELL - - IND.

RUNZEL-LENZ ELEC. MFG. CO.
ESTABLISHED 1904 CHICAGO

Specializing in Manufacture of

CORDS

FOR ALL CLASSES OF TELEPHONE WORK

SIERRE EQUIPMENT CORPORATION
Los Angeles—San Francisco—Seattle—Pacific Coast Distributors

Independent Sales and Engineering Company, Limited
VANCOUVER, B. C.

THE complete stocks of telephone apparatus, construction materials and supplies carried in our Vancouver warehouses enable us to render unsurpassed service in Western Canada.

MANUFACTURERS AND DISTRIBUTORS OF

TELEPHONES, TELEPHONE APPARATUS AND MANUAL AND AUTOMATIC SWITCHBOARD EQUIPMENT

Representatives in Western Canada for

AMERICAN ELECTRIC INC., Chicago
AUTOMATIC ELECTRIC COMPANY, INC., Chicago
AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., Liverpool
THE AUTOMATIC ELECTRIC COMPANY, LIMITED, Chicago

Correct Sitting Posture Important to the Voice With a Smile

The direct connection between "the voice with a smile" and the sitting posture of the owner of the voice is lucidly described in a booklet published by the Do/More Chair Company, Elkhart, Ind.

Whereas an ordinary operator's chair permits the operator to slump, the Do/More operator's chair has been designed by physiologists especially to give the proper sitting posture, so that it will be easy and natural for the operator to sit up straight without conscious effort.

Do/More telephone operator chair, Model GL, embodying correct posture features. Genuine leather seat and back.

Do/More telephone operator chair, Model WC, embodying correct posture features. Combination wood and cane seat.

The chair gives support where support is needed—at the small of the back.

When a person is seated in the ordinary chair without the proper back support, the body sags, the lungs are contracted, the weight is unevenly supported, and the heart is overtaxed by the retarded circulation. As a result the nerves suffer, the muscles rebel, the brain becomes foggy and clouded, and the voice loses its "smile." These are facts unearthed by physiologists employed by Do/More who have discovered the flaws in ordinary chairs and endeavored to correct them in Do/More chairs.

The Do/More Telephone Operator's chair has an upholstered back which is adjustable both vertically and laterally. Thus it can be suited to the operator's individual requirements. The seat of one type of chair is a combination of wood and cane, and saddle shaped for the utmost comfort. There is also a foot ring. The seat is swivel and therefore its height also is adjustable. Another style of operator's chair has a leather rectangular seat, and still another has an oval seat, wood, with cane panel.

"It is a fact that anyone can maintain proper posture while seated upon any kind of chair. However, this act requires constant effort which not only distracts from concentration, but results in fatigue. A chair should conform to the anatomical lines of its occupant. But even this is not enough. If complete effectiveness is desired, the chair must be so constructed that it can be adjusted and fitted to individual requirements with the same degree of accuracy that shoes or clothing are fitted." This is according to the Do/More booklet.

Although some attention has been paid to posture during the last few years it has been confined largely to school rooms. There, students have been believed to do better work when they sat, stood, and walked correctly. They were mentally alert.

If the correct posture increases physical and mental well-being in school, why not in offices and telephone exchanges, so the Do/More Chair Company doubtless argued. The result of the research includes adjustable chairs for executives, secretaries, clerks and typists, as well as telephone operators.

The person seated in a Do/More chair benefits greatly from the correct posture giving features. Undue pressure at all objectionable points is eliminated. His head and shoulders are supported upon his spine as they should be, in a proper line of gravity. The spine itself is held in a natural position without accentuation of its normal curve in any direction. No undue stretch is put upon muscles and ligaments which unite the elements of the spine.

He is not only permitted to assume a proper posture in a Do/More after it has been adjusted to his particular requirements, but without thought or intention he will assume and maintain such posture throughout the working hours, thus favoring the following four factors of life: full lung capacity breathing; proper blood oxidation; unrestricted function of the eliminatory system; and lessened expenditure of muscular effort.

As a result of these facts, a number of large exchange and office buildings have been completely equipped with Do/More adjustable chairs.

The operator who never becomes physically tired is the operator who makes fewer mistakes and whose voice is clear and bright—"the voice with a smile." Arguing from cause to effect, the Do/More people believe the operator who sits in a Do/More chair is the operator who gives the best and most cheerful service.

ILLINOIS TELEPHONE HANDBOOK NOW READY

(*Continued from page* 48.)

charge of storage batteries, crossarm data, creosoted wood duct ZMA, pole preservative and instructions for unloading, counting and handling poles. This last subject also covers instructions for accident prevention in unloading poles which makes use of five photographs of the right and wrong way to do this type of work. Suggestions are also included for the correct storage of poles.

The accompanying photograph gives a good idea of the convenient size and attractive appearance of the 10th edition of the Handbook. There is available a limited supply of these Handbooks which may be secured from the Illinois Telephone Association, Springfield, Illinois. These books will make acceptable Christmas presents for progressive telephone men.

AMERICAN CROSSARM & CONDUIT CO.
14 Mills Main Office—Chicago, Ill. 73 Warehouses
Manufacturers and Distributors
CROSSARMS — FIR — Creosoted — Yellow Pine
Creosoted Wood Conduit
Pin and Brackets

Super-Service on rush orders!

If you are in a hurry your order can be loaded and on the way the same day we receive it. Quality poles since 1882 assures you of guaranteed stock and satisfactory dealings. Let us quote you prices.

Northern and Western Cedar
With or without butt treatment

NAUGLE POLE & TIE COMPANY
59 East Madison Street, Chicago
Branches: New York, Columbus, Kansas City, Spokane, Los Angeles, Boston, Madison.
Main Yards and Butt-treatment Plants: Minneapolis, Pinconning, Michigan, Spokane, Sand Point, Idaho, Seattle, Arrowhead, B. C.

Naugle Poles

Insure Your Overhead Lines

BY SPECIFYING

MacGillis

NORTHERN or WESTERN

CEDAR POLES

PLAIN or BUTT-TREATED
FROM

MacGillis & Gibbs Co.
120 E. Wisconsin Avenue
MILWAUKEE - WISCONSIN

YOU CAN BUY POLES

From Advertisers in this Publication with assurance they meet with specifications.

Cedar Poles

Northern White Western Red
Plain or Treated Butts

Prompt Shipment from Minneapolis Yard.

T. M. Partridge Lumber Co.
Minneapolis, Minn.

Takes the place of 6 men . . .

Simplex Pole Jack

Templeton, Kenly & Co., Ltd.
Sole Manufacturers
Established 1899 Chicago, Ill., U. S. A.
Foreign Distributors:
International Standard Electric Corporation
Northern Electric Company, Ltd.

Activities of the Plant Division, U. S. I. T. A.

A. L. Staderman, Chief Engineer of the Citizens' Home Telephone Co., Terre Haute, Ind., Chairman of Plant Division; Gives Annual Report Before General Convention of United States Independent Telephone Association in Chicago; Urges Various Telephone Interests to Coordinate Their Engineering Practices.

For the benefit of any new members and at the risk of repetition, it may be well to state that the activities of the Plant Division are divided roughly into two parts, one part consisting of representation on the American Standards Association in connection with standardization matters which affect the telephone industry, and, in addition, activities confined entirely to those within the confines of the association.

A description of the organization and operation of the American Standards Association cannot be done better than to quote from the year book of the American Standards Association, as follows:

"The American Standards Association is a federation of forty-three national technical societies, trade associations and governmental bodies. The chief purpose of the association is to bring together manufacturers, distributors, consumers, technical specialists, and any others directly concerned with a particular standardization project; to assure that a preponderance of these interests wishes to have a national standard; to bring about the organization of a technical committee composed of official delegates of all important bodies directly interested to formulate the standard; and, finally, when such a committee has prepared the standard and given it substantially unanimous approval, and the American Standards Association is definitely assured that the standard represents a real national consensus, to make it an 'American standard.'

"Any responsible trade, technical, social or governmental organization can request the initiation of a standardization project under the procedure of the American Standards Association.

"A technical staff carries on the association's work in connection with projects. The approval of standards is vested in the Standards Council which is composed of representatives of all of the member bodies of the association. The general administration of the association's affairs is vested in a board of directors composed of industrial executives.

"The American Standards Association is a member of the International Standards Association and acts as the official channel for international cooperation in standardization work with the similar national standardizing bodies in each of twenty foreign countries. It is also the regular channel for the distribution of standards and information concerning standardization activities originating both in the United States and abroad.

"The association was organized as the American Engineering Standards Committee in 1918 by five major engineering societies. As the work of the committee grew and its activities extended into new industrial fields, additional member bodies were added. In November, 1928, the committee was reorganized along broader and more flexible lines, and renamed the American Standards Association. Up to the present time the association has approved 166 standards, and projects for 171 other standards are under way."

The telephone group consisting of the Bell System and the United States Independent Telephone Association is represented on the Standards Council by representatives of the Bell System and this association. The actual detailed formulation of standards is done through sectional committees which report to the Standards Council.

The United States Independent Telephone Association is represented in the standardization work of the American Standards Association on ten sectional committees and various sub-committees in connection with ten projects, the status of which is as follows:

Project A-35—"Manhole Frames and Covers." A final draft is being prepared.

Project C-2—"National Electrical Safety Code." A recent revision is completed and is now published.

Project C-5—"Code for Protection Against Lightning." The work is entirely completed and is now published.

Project C-13 — "Specifications for Tubular Steel Poles." The work is entirely completed and is now published.

Project C-18—"Specifications for Dry Cells and Batteries." Standardization work in connection with a recent revision is now completed and a final draft is being prepared.

Project C-20—"Specifications for Line Insulators for Voltages Not Exceeding 750." Standardization work is under way.

Project C-42—"Definitions of Electrical Terms." Standardization work is under way.

Project O-5—"Specifications for Wood Poles." Standardization work is now completed and a final draft is being prepared. During the past year the important subject of determining the fibre stresses of wood poles for various kinds of wood has been completed after considerable research work. Having the latter information will enable an early completion of the specifications which will be of considerable importance in all pole line engineering work.

Project Z-10—"Scientific and Engineering Symbols and Abbreviations." This project is subdivided into fifteen sub-projects and the status ranges all the way from the decision to undertake standardization to entire completion and publication. The sub-project Z-10-G-6, entitled "Symbols for Telephone and Telegraph Use," is now in published form.

Project Z-14—"Standards for Drawings and Drafting Room Practice." This project is subdivided into six sub-projects, for two of which the standardization work is still under way and for four of which a final draft is being prepared.

Activities within the association were as follows:

Due to the increased importance of toll business on account of its recent rapid growth and promise of still faster growth, the Plant Division of this association has given special attention to the subject of toll plant and especially from the transmission standpoint. This increased growth in the toll plant has been due to several causes, one of which is the improved traffic practices of completing the toll call at the same time that the call is given, known as the combined line and recording or C. L. R. method. The latter method, however, would not be possible without adequate facilities, as a toll line must be available at the time the call is placed or the C. L. R. method cannot be operated, and, last but not least, all efforts would be in vain if the transmission qualities of the toll line would not be adequate to carry on a satisfactory conversation.

The great improvement in transmission no doubt has had a great effect upon increasing toll business as it is no longer an ordeal to carry on a toll conversation as it was in olden days when poor transmission was common.

In order to be sure of adequate trans-

EFFICIENCY

Here are two lights universally accepted by "trouble shooters" as superior for every requirement.

The Industrialite makes and breaks contact conveniently through a twist of the top cap. An emergency bulb is kept in a tiny clip within the head assembly.

The Lantern needs no introduction to telephone men. It brilliantly illuminates a wide area and may be used at any angle.

BOND ELECTRIC CORPORATION
Jersey City, N. J.
CHICAGO SAN FRANCISCO

DEPENDABILITY . . . long life . . . economical operating and maintenance costs are the reasons why the use of Exides is increasing in P.B.X. service.

EXIDE-IRONCLAD P.B.X. BATTERIES

Exide - Ironclad Battery, type B.I.-5, especially designed and constructed for P.B.X. service.

Tubular construction of Exide Ironclad positive plate gives longer battery life.

Exide BATTERIES

THE ELECTRIC STORAGE BATTERY CO., PHILADELPHIA

dependable

NORTHERN WHITE CEDAR POLES

that offer *utmost* in Quality and Value.

Guaranteed Butt Treatments

MICHIGAN POLE & TIE CO.

NORTHERN AND WESTERN POLES
NEWBERRY, MICHIGAN

Reed City, Mich. YARDS St. Paul, Minn.

Both are Standard

WHENEVER you hear the name "Hamilton Watch" mentioned you think of *accurate time*. It is the choice of those who take pride in the possession of a watch that measures up to the highest standard of accuracy.

Among linemen the name "Vacuum Grip" represents the highest standard of pliers construction. It is the "Hamilton of pliers."

The Professional Lineman pattern illustrated here is the recognized standard, in design and quality, for pliers of its type. Every one of the sixty-two separate processes entering into its construction is an expression of superior craftsmanship. That is why these pliers have easy-riding joints—keen cutting blades that retain their sharpness and alignment—and tremendous over-capacity gripping power!

Back of their fine design and workmanship is the stamina furnished by the toughest, strongest steel known to science, electric furnace high carbon Molybdenum alloy tool steel, hardened and tempered *thru and thru!*

VACUUM GRIP
PROFESSIONAL LINEMAN PLIERS

No. 58—8½" No. 57—7"
No. 56—6" No. 59—9"
No. 158—8½" (Sleeve twisters in handles.)

Name of Company or lineman etched Free on handle of each pair

PURCHASING AGENTS: A Running Test will demonstrate the long wearing qualities and economy of these powerful rugged pliers. Write for prices of samples for your man. Ask for Catalog describing over 50 Vacuum Grip patterns and sizes.

FORGED STEEL PRODUCTS CO.
Newport, Pa.

OVER 700,000 VACUUM GRIP PLIERS IN USE

mission, it is necessary that every link in the toll chain be properly designed for its purpose. This means that in order to give universal service every telephone should be able to be connected with any other telephone in the United States and more recently including a large part of Europe and South America and the balance of the world to follow.

We thus see how important it is that the various telephone interests should coordinate their engineering practices; thus it is necessary that European and South American engineers coordinate their plans with American engineers, and it is especially important that engineers in this country plan their plant in a coordinated manner, that is, engineers of the Independent group of companies and the Bell group of companies must be together on their standards so that a successful toll connection can be completed. This means that it is necessary for the engineers in both fields to understand the problem of the other. It is for this reason that attention was given during the past year and will be given in the future to the proper engineering of toll lines by our member companies.

Moreover, the present time is the most favorable time for rebuilding toll lines that has existed for many years as the price of copper is as low as can ever be expected and improvement in the toll system so far as an outside line is concerned consists largely of using copper to replace iron wire or adding additional copper circuits to relieve overloaded circuits.

Recently the engineers of the Bell System have prepared a general switching plan for telephone toll service throughout the United States and eastern Canada. This toll plan provides for the allocation of transmission losses in the different sections of a telephone circuit so that the resulting transmission will be substantially uniform irrespective of the distance separating the subscribers.

At the June meeting of our class "A" companies the writer has given an illustrated explanation of the general toll switching plan for the United States and eastern Canada and will repeat the same in a more detailed manner at the plant conference Wednesday afternoon, giving special attention to transmission requirements.

The importance of the Independent group in the general toll plan is indicated from the fact that the Independent group operates about 25 per cent of the telephone stations in the United States and originates about $36,000,000 of toll business or between ten to fifteen per cent of the total toll business passing wholly or partly over lines of the Bell group. The above business excludes that passing entirely over toll lines of the Independent group.

It is unnecessary to state to any telephone man the importance of having good toll lines both from the standpoint of pleasing his subscribers as well as his stockholders. It is, unfortunately, true that in the past proper attention has not always been given to the toll plant. Perhaps in the days when interconnection was less common than at present this fault was not so serious, but it certainly is important now for every company to meet its connecting company on the proper basis not only as a matter of fairness to the connecting company but as a matter of financial benefit to itself, and, as mentioned before, especially at this time with the favorable material costs, no company should miss the opportunity to get its toll lines in standard shape.

While stress has been placed upon the toll lines, consideration should also be given to the exchange plant. The most prolific source of transmission losses is in faulty substation equipment as well as faulty exchange cable design. In the early days when there were only cables in use having heavy conductors, errors in engineering were not so easily made as today. The modern plant today requires thorough engineering as, since small conductor cables are available, it is possible to make a saving in first cost but also to cause poor transmission if proper consideration is not given to the proper use of the various gauges of cables.

It is the province of the engineer not to spend a dollar where it does no good and to reserve it for use where the most benefit will result therefrom. Availability of various gauges of exchange cables has made it possible for the engineer to save considerable money where formerly this was not true and the company can well afford to invest some of this saving in places where it is absolutely necessary for proper transmission.

This preachment is addressed to this meeting in hopes that executives will cooperate with their plant department when request is made for authority to improve their transmission conditions and also that if the plant department does not make any requests that the executives urge the plant department to make a survey and submit recommendations for whatever changes may be needed in order to put the telephone company on the proper basis for handling toll business, thus making it possible for the Independent group to handle its share of the toll business in a manner which will require no apologies and which also will result in financial profit for the Independent group.

MO. TELEPHONE ASS'N HOLDS ANNUAL MEETING IN KANSAS CITY

Continued from page 46)

over of a new switchboard. Incidentally, he suggested that if the editor were asked to make the first call, the story would doubtless be given more space and a prominent position. Editors, said Mr. Smith, regardless of their reputation for being hard-boiled, are human.

He also referred to the telephone service to trains recently inaugurated in Canada and stated that when this is started in this country it will be big news. Any new service, unusual and extraordinary, is good news for the newspapers, he explained. Building projects are always news, he said.

The telephone has displaced the telegraph because of its speed, said Mr. Smith, and this speed element, properly treated, may be made the basis for what is called a "feature" story. He spoke also of the "human interest" story and gave as an example a redhead discovered among a lot of blonde and brunette telephone operators, which might be used to make a clever story.

F. B. MacKinnon, Chicago, president of the United States Independent Telephone Association, addressed the convention on "National Telephone Problems." He referred to progress made in the art of telephony, mentioning the opening of transatlantic service, which has since been greatly extended. He spoke of the demonstration of two-way telephony last spring and said that television is not yet a commercial matter because of the great expense involved.

He advocated that state associations should be made business associations and have, as does the Illinois association, a transmission engineer, an accountant and auditor as another association has. The amount which goes into a state association is, he declared, very small in comparison with the companies' revenues and in proportion to the benefits.

Two discussions were held in connection with the operators' conference which was attended by 150 delegates. Miss Carrie Lee Thomas, employment supervisor, Southwestern Bell Telephone Co., Kansas City, presented methods used in interviewing and placing applicants for positions in the traffic department. "Opportunities of Traffic Employes to Sell Toll Service" was the subject presented by P. P. Cheatham, toll traffic supervisor, Southwestern Bell Telephone Co.

John J. Kline, chief engineer and plant manager, Middle States Utilities Co., Plattsburg, led discussions in the linemen and troublemen's conference, attended by about 90.

The final session was addressed by R. B. Still of the Telephone Bond & Share Co., Kansas City, on the subject, "Telephone Associations Here and There," and a first-aid demonstration under the supervision of C. H. Weiser, plant personnel supervisor, Southwestern Bell Telephone Co., followed Mr. Still's address.

SUBSCRIBER RECORDS FOR SMALL EXCHANGES

(*Continued from page 27.*)

In exchanges which have a regular repair desk or trouble operator this card file should be handled by him exclusively as it must be kept by some one who is familiar with its functions and advantages, in order to be an intelligible and informative record. The cards in the file should never be taken away from the office because of the danger of loss or accidental destruction. If the company regularly employs a testman the repair clerk should, after transcribing the report on the card, turn it over to the testman, who tests the case and dispatches a repairman to clear it. After it is cleared he marks the card properly and returns it to the clerk, who refiles it in its proper place. In case there is no tester regularly stationed in the exchange the repair clerk or trouble operator should remove the card from the file and when the repairman calls her for a list of trouble she should give him the report verbally, together with any circuit information which he may desire. When he clears the case he calls her back and reports it as cleared, together with the nature of the trouble and exact time it was cleared. She then enters this information on the card and returns it to file.

All this in brief is a system of trouble recording which is inexpensive and easily put into operation. Printed forms of these cards may be obtained from most any telephone accountant. While the forms I am familiar with are not exactly similar to the one illustrated they have so many points of similarity that they may be fitted in to this system very conveniently.

PRINCIPLES OF THE AUTOMATIC TELEPHONE

(*Continued from page 22.*)

relay is held in due to the ground of the release trunk, therefore when this is removed the Sw. relay will release. This restores the ground to the line relay (LR) and then the release magnet battery finds a circuit to this ground and operates the release mechanism of the selector.

The release magnet and the RIR are supplied with non-inductive windings to take up the counter EMF surges which would cause burning of the contacts. The rotary and vertical magnets are equipped with ½ MF condensers and 10 ohm non-inductive resistances to suppress sparking at the contacts. When a switch is being held during a conversation, only the Sw. relay is operated, and the switch becomes the equivalent of a cord ending trunk circuit.

ELDRIDGE TO REPRESENT DO/MORE CHAIR COMPANY

Arrangements have been completed for the distribution of Do/More chairs to the industrial trade, specializing in the telephone field, by the Frank L. Eldridge Company of Chicago. The Eldridge company will cooperate with jobbers and other agencies as national representatives of the Do/More Chair Company.

Frank L. Eldridge

Do/More chairs, which are manufactured in Elkhart, Ind., are recognized and used in the telephone industry, because of their sturdy metal construction and special features for proper seating which assures health, comfort, and increased efficiency, for general office service, and especially for telephone operators.

TOLEDO-CLEVELAND UNDERGROUND CABLE TO COST $6,700,000

Construction of $6,700,000 in underground telephone cables between Toledo and Cleveland will be begun this year as part of a $25,000,000 construction program in Ohio, President Randolph Eide of the Ohio Bell Telephone Co. announced Monday.

The building program, the largest since 1925, is offered as a contribution to the employment problem and is also designed to care for increased business.

Other projects include a $7,000,000 construction in Dayton; reconstruction of the Akron-Barberton-Cuyahoga Falls system at a cost of $6,000,000.

Addition of a new exchange to Toledo's system was also indicated by President Eide.

UNIQUE FURNACE

GASOLINE—KEROSENE

PATENTED ARRANGEMENT FOR DISLODGING COIL WITHOUT TEARING DOWN FURNACE
PATENTED SEAMLESS TUBING COIL GENERATOR
IMPROVED ONE PIECE BURNER
HAND HOLD FOR CLEANER ONE TURN CLEANS ORIFICE
AUTOMATIC ORIFICE CLEANER
AUTOMATIC PUMP INSIDE TANK
18 GUAGE STEEL TANK WELDED BOTTOM

10 MINUTES TO MELT 50 lbs. OF SOLDER

But—more important—

The experienced cable splicer will be surprised at the length of time it will remain in the field without attention!

Literature?

UNIQUE MANUFACTURING CO., Inc
221 Whiting St. Chicago, Ill.

TRAVELERS select the Great Northern for its wonderful location in Chicago's "loop". They return because the large comfortable rooms, homelike environment, attentive service, excellent food and moderate charges make it an ideal hotel.

400 Newly Furnished Rooms
$2.50 a day and up

Sample Rooms
$4.00, $5.00, $6.00
$7.00 and $8.00

Dearborn St. from Jackson to Quincy
New Garage One-Half Block

SHOWS GROWTH OF ATHENS, OHIO, EXCHANGE

A recent edition of an Athens, Ohio, newspaper carried special writeups of the important utilities and commercial interests of the city in celebration of the twenty-fifth anniversary of the publication.

The Athens Home Telephone Company during the quarter century has grown from a very small exchange to one of the most modern and important utilities of the state. During all these years Dr. C. L. Jones has been at the helm, first as a godfather to an infant industry and later as the guiding spirit in a company of which his city and the entire state feels proud.

The Pacific Telephone & Telegraph Company budget for 1930 improvements was cut from $65,000,000 to about $49,000,000 and the program to spend $300,000,000 in the next five years has been amended to provide for expenditure of $40,000,000 annually for the next three years with no plans for later periods.

The final link in an underground telephone cable, connecting Oklahoma City and Dallas, Texas, will be completed in July, 1931, at a cost of $3,000,000, according to R. J. Benzel, general manager of the Southwestern Bell Telephone Company.

ACCOUNTING

Specialization on Public Utility Accounting Records and Audits enables us to best serve Telephone Companies.

HERDRICH AND BOGGS

Certified Public Accountants

901-7 Continental Bank Bldg., Indianapolis, Ind.

RECONSTRUCTED EQUIPMENT

General Elec. Mercury Arc Rectifier, No. 11,139, Cat. No. 119,593, operates from either 110 or 220 Volt 60 cycle Ckt. Delivers 10 to 120 Volts D. C. Current, 10 Amps. Complete with Volt and Amp. Meters and voltage regulator and one extra Tube @	$100.00
Stromberg No. 190 type or Dean Peanut line and cut-off relays on mounting plates, Units of 50 pairs $50.00—Units of 60 pairs @	60.00
Dean or Stromberg No. 4260 Ans. or Lamp jacks with lamps 10 per strip @	2.00
22 or 24 volt Swbd. Lamps, per 100	5.00
Kellogg No. 17A repeating coils @	3.75
Kellogg No. 28 desk sets with cast head complete with W. E. No. 240 3-bar 1000-1600 or 2500 ohm external post connection signal set @	8.00
Kellogg No. 28 desk set with cast head complete with Stromberg 4-bar 1000-1600 ohm inside cord connection signal set @	8.75
Kellogg No. 2696 type 4-bar 1000 or 1600 ohm Bdg. compacts @	8.50
Western Elec. No. 240 3-bar 1000-1600 or 2500 ohm External post connection hotel set @	5.00
Chicago Tel. 4-bar 1000 or 1600 ohm Bdg. compacts @	6.75
Western Elec. No. 317 inside connection 3-bar 1000-1600 or 2500 ohm Bdg. compacts @	8.75
Dean Elec. No. 240 4-bar 1000 or 1600 ohm Bdg. compacts with Kellogg Transmitters @	7.00

Write for Bulletins

REBUILT ELECTRIC EQUIPMENT CO.

1940 West 21st Str., Pilsen Station Chicago, Ill.

POSITIONS WANTED

POSITION WANTED: Storekeeper wants position immediately. Fourteen years' general storeroom experience and two with telephone company, during an expansion program. Age 35 years. Address P-1, % TELEPHONE ENGINEER, 192 N. Clark St., Chicago, Ill.

POSITION WANTED: Reliable telephone man, 9 years lineman to switchboardman and 6 years resident manager 1300 station exchange. Willing to work any position. Available after December 15th. Address P-2, % TELEPHONE ENGINEER, 192 N. Clark St., Chicago, Ill.

POSITION WANTED: By an executive thoroughly experienced in management of telephone properties—commercial, traffic, plant engineering. Desires connection with syndicate or holding company. Will go anywhere. Prospective future more important than immediate salary. Reference furnished by former employers and others prominent in the industry. Address P-3, % TELEPHONE ENGINEER, 192 N. Clark St., Chicago, Ill.

POSITION WANTED: As cable splicer's helper or driver. Have had 3 years experience as splicer's helper. 24 years of age. A-1 reference, high school graduate. Address P-4, % TELEPHONE ENGINEER, 192 N. Clark St., Chicago, Ill.

W. B. WALKER UNDERGOES OPERATION

W. B. Walker, efficient representative of the Lynton T. Block Company of St. Louis, recently underwent an operation for appendicitis. He is expected back at his desk shortly and it is hoped that his health will be greatly improved.

Mr. Walker has been attending National and State conventions for the past few years and is well known to the industry. His many friends extend wishes for a speedy recovery.

MISSOURI COMPANY TO INSTALL STROMBERG EQUIPMENT

The Scotia Telephone Company of St. Louis, Mo., recently contracted with the Stromberg-Carlson Telephone Manufacturing Company for a four position No. 3 unit type switchboard for its exchange at Washington, Mo. The board will consist of 710 central energy, 30 toll and rural lines, and will be complete with power, terminal and machine equipment.

The Southwestern Bell Telephone Company is making preparations to improve toll lines in Arkansas, and to make other improvements in the service.

J. G. WRAY & CO.

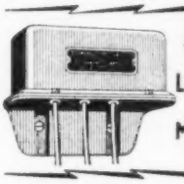
Telephone Engineers

Specialists in Appraisals, Rate Surveys Financial Investigations, Organization and Operation of Telephone Companies

J. G. Wray, Fellow A. I. E. E.

Cyrus G. Hill

Rm. 2130 Bankers Bldg., Chicago



CHAPMAN LIGHTNING ARRESTERS

MADE BY MINNESOTA ELECTRIC CO

MINNEAPOLIS, MINN.

We will sell your

Telephone Directory ADVERTISING

or will publish your directory complete

L. M. BERRY & CO. DAYTON, OHIO

Send for free sample and prices on

UNIVERSAL DROP WIRE INSULATORS

Universal Specialty Company

711 Poplar St., Terre Haute, Ind

FOR SALE

200 Slightly Used Operators Chairs, $2.50 to $3.50 each.

Porcelain Knobs, 2 groove, $1.00 per 100, 4 groove, $2.00 per 100.

Bakelite Mouth-pieces for W. E. Transmitters, $6.00 per 100.

Gray No. 7 and No. 11, Pay-Stations 3 slot.

The Telephone Repair Shop

1760 Lunt Ave., Chicago, Ill.

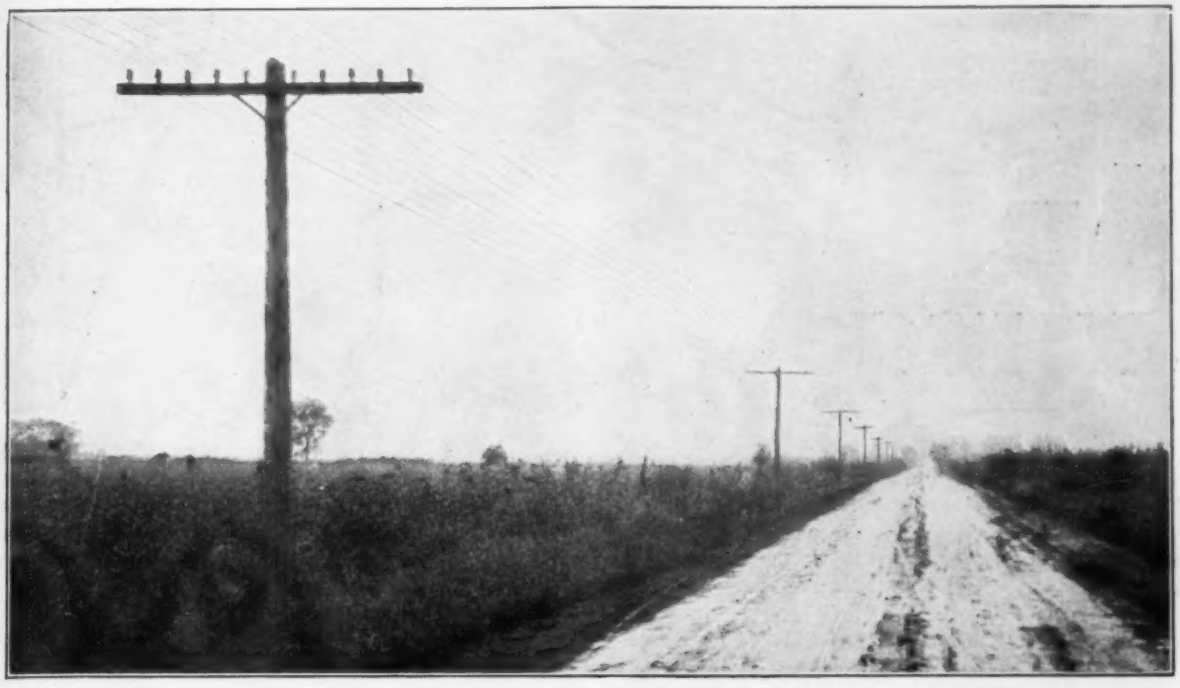
Telephones bought, sold and repaired. We list telephone plants for sale or exchange.

American Electric Co. Equipment

No. 50 transmitters	$ .75
No. 60 receivers with new shells and caps	.75
New shells and caps	.35
No. 102 or 127 switch hooks	.45
No. 76 ringers	1.00
½-MF, 1-MF and 2-MF Mansbridge condensers	.50
5-C and 31-B induction coils	.50
3, 4 and 5 bar Hercules late type generators	$2.00, 2.50 and 3.00

Buckeye Telephone & Supply Company

COLUMBUS, OHIO



Northern White Cedar Poles in lines of the Illinois Consolidated Telephone Co., near Taylorville, Ill.

"Stronger than Wind and Sleet"

Northern White Cedar Poles placed over thirty years ago are still in the line—doing service. They have withstood the ravages of time and storm and deterioration. They have held up heavy, sleet coated wires; they have stood fast when high winds shrieked through their cross arms; they have held without flinching.

Northern White Cedar Poles are strong and light and durable. They have the proper taper and are stoutest where the strain is greatest—just above the groundline. They are light and easy to handle. They are durable—Cedar has a natural resistance to decay and will last indefinitely.

Northern White Cedar Ass'n

Minneapolis Minnesota

Northern White Cedar Poles

"An Average Life of 35 Years",

says Southwestern Bell Telephone Company

"Two-Wire" Telephone Lines Are Dependable
"SHORTY" EDWARDS, construction
gang foreman, stringing wires on
the new "two-wire" rural line at Glas-
gow, Mo. Note how the pole, placed
at a bend in the road, leans to prevent
slack in the wires, and is guyed for
greater strength. The sturdy con-
struction and the bracing of all parts
form a striking contrast to the weak-
ness of the poles, for example,
crossoted for protection against
rot and wood boring insects, have
an average life of 35 years.
SOUTHWESTERN BELL TELEPHONE COMPA

"The poles, for example, creosoted for protection against rot and wood-boring insects, have an average life of 35 years."

THE Bell Telephone Company abides by the creed that "Service Must Not Be Interrupted." Bell has used excellent judgment in using CREOSOTED POLES, and such purchases are made only after tests proving the efficiency of the materials concerned.

Service conditions of unusual severity hold no terrors for NATIONAL Pressure-Creosoted Poles. These poles, produced from Southern Yellow Pine, are strong, uniform, rot and insect-proof, grass-fire resistant, require the minimum of maintenance and cost less per-pole-per-year than other types.

May we send you our new pole booklet?

National Lumber & Creosoting Company

General Office: TEXARKANA, ARKANSAS

Plants: **Texarkana, Tex.; Houston, Tex.; Kansas City, Mo.; Salida, Colo.; Alexandria, La.; Columbia Park (Finney), Ohio; Superior, Wis.; Denver, Colo.**